# 1992 IMPLICATIONS of a SINGLE EUROPEAN MARKET

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CANADA
EUROPE

External Affairs and

# 1992

# IMPLICATIONS

# OF A SINGLE EUROPEAN MARKET

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## SPECIALTY CHEMICAL PRODUCTS, NEW MATERIALS, PHARMACEUTICALS AND BIOTECHNOLOGY

February 1990

91-01597/

**ACKNOWLEDGEMENTS**

Interviews with a number of people were indispensable in putting together this report. We are indebted to Jeff Greenberg (ADI Diagnostics), Oliver Hempel (Alkaril), Edward Florence (Apotex), Richard Glinsky (Canadian Advanced Materials Forum), Art LeNeveu (Canadian Chemical Producers Association), Bob Cool (Domtar), Manon Laporte (Incoterm), Gerry Finn (Polysar), Ron Evason (Society of Plastics Industries) and Graham McRae (Vetrepharm). In addition, a number of ideas in this report originated in conversations with Chris Green (McGill University).

This report was prepared by Michael R. Smith of McGill University, Montreal, under the direction of Raymond Chabot International Inc., Bureau d'Informations et de Prévisions Économiques, and Informetrica for the Department of External Affairs and International Trade Canada.

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## FOREWORD

The European Community (EC), with a GDP similar to that of the United States, is Canada's second-largest trading partner and source of investment and technology. Canadian companies therefore have a particular interest in the completion of the European Community's internal market. The goal of the Single Market program, or Europe 1992 as it is often called, is the complete removal of barriers to the movement of goods, services, labour and capital within the 12 states of the Community to create a dynamic and rapidly growing market.

External Affairs and International Trade Canada (EAITC) is pleased to present this study as part of a series of reports on the implications of a Single European Market on Canada's trading, investment and technology interests. The areas to be covered by these reports include (in publication order):

Agriculture and Food Products
Consumer Goods and Cultural Industries
Telecommunications and Computers
Automotive Industry
Minerals and Metals
Forest Products
Defence, Aerospace and Transportation
Specialty Chemical Products, New Materials, Pharmaceuticals and Biotechnology
Industrial Products and Services
Financial Services
Fisheries Products
Professional and Consulting Services

These reports, prepared by Raymond Chabot International Inc., BIPE (Bureau d'Informations et de Prévisions Économiques) and Informetrica Ltd. analyse the trends, export impact, competition, investment implications and technological acquisitions arising from the EC Single Market of 1992.

This series of reports complements an earlier study published by EAITC, *1992: Effects on Europe*, which details the major economic and trade effects of the integration. Now in its third printing due to popular demand, the report provides a clear picture of the unification legislation and implementation measures and the general expectations and response of European industry.

Following the publication of these sectoral reports, EAITC will focus on subsectors of Canadian industry in which particular opportunities arise from the Single Market. These studies will go into much more detail on the trade ramifications specific to each subsector.

Together these reports, the overview presented in *Effects on Europe*, the sectoral analyses of this series of studies, and the subsector details of the next phase of Europe 1992 reporting, are not simply an information base for Canadian business people, but can be seen as a call to action. Europe 1992 is happening now. It will affect the way we do business. We have to know about it. And we have to plan to profit from it.

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## LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| BRITE | Basic Research in Industrial Technologies for Europe |
| CEFIC | Conseil européen des fédérations de l'industrie chimique |
| CEN | Comité européen de normalisation (European Committee for Standardization) |
| EAITC | External Affairs and International Trade Canada |
| EC | European Community |
| ECU | European Currency Unit |
| EFTA | European Free Trade Association |
| EMS | European Monetary System |
| EURAM | European Research on Advanced Materials |
| F.R.G. | Federal Republic of Germany |
| FTA | Canada-U.S. Free Trade Agreement |
| GATT | General Agreement on Tariffs and Trade |
| GDP | Gross domestic product |
| OECD | Organization for Economic Co-operation and Development |
| PVC | Polyvinyl chloride |
| R&D | Research and development |
| U.K. | United Kingdom |
| U.S. | United States |
| VAT | Value-added tax |

## EXECUTIVE SUMMARY

The creation of the Single European Market involves a reduction in administrative delays associated with intra-EC trade, an attempt to standardize value-added taxes (VATs), harmonization of product standards, transparency in product registration and licensing decisions, a strengthening of intra-EC intellectual property rights and, to offset the greater competition involved in the Single Market, some further legislated protections for employees. It is expected that the net effect of these changes will be a substantial increase in EC economic growth. This economic growth will create a wide range of business opportunities in the industries examined in this report -- for Canadian as well as for European firms.

The relative competitive strength of EC firms within the sectors covered by this report varies. The EC has more than its share of the world's largest chemicals and resin-producing firms. These firms are widely thought to have a technical edge over their North American competitors. They have been particularly aggressive in increasing their production of specialty chemicals and resins, which are usually characterized by higher value added and less cycle-sensitivity. There is also some strength in advanced industrial materials, partly based in European strength in resins and partly based in experience in the use of such materials in other industries in which European firms have strength -- in particular, defence, nuclear energy generation, and automobiles. While there is also some EC strength in pharmaceuticals and biotechnology, on balance, Europe tends to fall behind North America in this area, largely because of the market fragmentation that Europe 1992 is designed to overcome.

EC firms have been preparing themselves for the Single Market in a number of ways. First, there have been a large number of mergers of EC firms, particularly within countries where the industry is relatively weak (such as Spain); second, EC firms have been buying or establishing joint ventures with North American firms or divisions either to secure North American marketing expertise (particularly in pharmaceuticals) or, in some cases, to exploit a perceived technical advantage in North America and at the same time to evade the increased competition of the Single Market (particularly in plastics).

The capacity of Canadian firms to exploit the opportunities provided by Europe 1992 is affected by several factors.

- The Canada-U.S. Free Trade Agreement (FTA) has mixed effects. On the one hand, adjusting to the FTA means that some firms have enough to do without worrying about the opportunities provided by Europe 1992. On the other hand, the growth in scale and specialization often produced by the FTA means that firms are better able to compete in other international markets, including Europe.

- A good part of the Canadian industries covered by this report is made up of foreign multinationals that already have divisions in Europe. The benefits of Europe 1992 for Canada involving these firms depend on the capacity of local Canadian managements to secure world or regional product mandates. Given the scale and technical level of plants in these industries in Canada that seems more likely in chemicals and resins than in pharmaceuticals.

- Firms have various methods for exploiting the Single Market available to them. If they do not already have production facilities in Europe they can invest in them.

They can establish joint ventures with European firms. They can export to Europe, either through their own sales organization or through marketing arrangements with European firms. In general, the greater the "presence" of a firm in the EC the better equipped it will be to profit from the Single Market. Firms with production facilities within the EC will normally have better information about market opportunities than firms without production facilities and will also likely be better informed about, and able to influence, relevant product standards decisions.

Firms that neither do business with the EC nor plan to do so cannot assume that they will be unaffected by Europe 1992. The Single Market is likely to increase the size and competitiveness of those firms that exploit it and they are likely to use their additional resources to increase their presence in North America, or in other world markets. Sooner or later, even firms without economic connection with the EC are likely to face greater competition as a result of Europe 1992.

## INTRODUCTION

The European Economic Community, now called the European Community, was established in 1957 by the Treaty of Rome. The six original signatories (France, the Federal Republic of Germany (F.R.G.), Italy, Belgium, Luxembourg, and the Netherlands) undertook to eliminate barriers to the movement between them of goods, persons, services, and capital. In the 30 or so years since 1957 the EC countries (now including the United Kingdom (U.K.), Ireland, Denmark, Greece, Spain and Portugal, as well as the original six) have eliminated tariffs on each other's industrial goods and largely opened labour markets to each other's nationals. With the European Monetary System (EMS) they have also taken steps to reduce the extent to which currency fluctuations constitute an obstacle to intra-EC trade, although the U.K., Portugal, and Greece still remain outside it. The result is a tariff-free area that covers not only the 325 million people of the EC countries but, for industrial goods, has been extended to include the countries of the European Free Trade Association (EFTA) -- Finland, Norway, Sweden, Switzerland, Austria and Iceland.

But the effect of the removal of tariffs on the freedom of trade between EC countries has, to a substantial extent, been offset by non-tariff barriers of a variety of sorts which may even, in fact, have become more acute as the governments of EC countries have tried to find ways to preserve national industries and jobs. "Europe 1992" refers to a package of measures designed to reduce non-tariff barriers to intra-EC trade. The EC Commission has targeted December 31, 1992, as the date by which this Single Market is supposed to have been largely accomplished.

This report provides an analysis of the implications of the EC Single Market for a group of Canadian industries -- chemicals, plastics, advanced industrial materials, pharmaceuticals, and biotechnology. While all these industries are science based, they vary greatly in their characteristics, problems, and in the degree to which Europe 1992 provides them with new opportunities.

The body of the report includes descriptions of each industry in Canada and Europe, a discussion of the likely industry-specific implications of the Single Market, a review of the private and public sector strategies for dealing with it listed by those interviewed for this study, and a brief appraisal of the risks and opportunities it provides. Despite the diversity of the industries considered here, the analysis does suggest some general conclusions. First, the ability to exploit opportunities provided by the Single Market is for many firms tied to the ability to adapt successfully to the opportunities provided by the FTA. Getting into Europe is likely to be facilitated by a scale of operations made possible by production for both the Canadian and United States (U.S.) markets. Second, the implications of the Single Market depend on whether or not a firm currently trades with Europe and if it does, on the nature of that trade -- in particular, whether it involves direct investment or exports. Third, even firms that do not trade with Europe are likely to be affected by the creation of the Single Market as European firms acquire resources from the growth it creates and use them to expand into other markets, including North America.

The information upon which this analysis is based comes from various government statistical agencies, a number of published analyses, and from interviews with with experts knowledgeable about the industries, in particular, company executives with exporting experience.

# 1. THE CANADIAN CHEMICAL INDUSTRY

In 1988 the Canadian chemical industry shipped almost $22 billion worth of goods. Two-fifths of this total is accounted for by industrial inorganic and organic chemicals (Figures 1 and 2). A significant and increasing proportion is also accounted for by the pharmaceuticals (15.2 per cent) and the plastics and resins (12.3 per cent) industries.

Industrial (or "commodity") chemicals also dominate international trade in this sector (Figures 3 and 4). Canada has run a trade surplus in industrial chemicals over the past five years ($3.5 billion of exports versus $2.5 billion of imports in 1988). In plastics, resins, and elastomers there has been a persistent deficit, although its magnitude has been declining ($1.58 billion of imports versus $1.48 billion of exports).

The most substantial deficit has been in "other chemical products." This is the sector in which many, but not all, of the products considered to be "specialty chemicals" and "fine chemicals" are located. The former are compounds manufactured to satisfy a specific or narrow range of chemical functions. The latter are chemicals produced in small quantities to high standards of purity, largely as ingredients in pharmaceuticals. In each case these products are typically characterized by high value-added input in the manufacturing process, fairly high price mark-ups, and relative insensitivity to cyclical fluctuations. The large, international (often European), chemical companies have been shifting into the production of fine and specialty chemicals over the last decade and the bulk of such chemicals consumed in Canada are imported -- mainly from the U.S. or Europe.[1] It was recently estimated that there are about 92 producers of fine and specialty chemicals in Canada.[2] Nonetheless, this has not produced substantial exports of these chemicals. In interviews conducted for this study experts estimated Canada's exports of these products at about $170 million and imports at about $2.5 billion.

In 1988, of Canada's $6 billion of chemical exports the U.S. took almost two-thirds. As Figure 5 shows, less than 11 per cent went to EC countries, which are considerably less important as an export destination than the Pacific Rim countries, including Japan.

A small number of organic chemicals produced from oil and natural gas account for the bulk of Canada's exports. Polyethylene, styrene, methanol, ethylene glycol, polypropylene and isobutene-isoprene (butyl) rubber all appear in the list of the top 10 chemical exports in 1988 (in terms of value) (see Figure 7). Of the four remaining inorganic chemicals on the list, ammonia and urea are inorganic by-products of organic chemical manufacturing processes. That leaves uranium and "other radioactive elements" as the only chemicals in this list not originating in the processing of oil and natural gas.[3] These 10 commodity chemicals alone account for a little more than half of the value of total Canadian chemical exports. The pattern of exports to the EC is similar, except that the single most important export is uranium (see Figure 6).

## 1.1 Petrochemicals, including Resins and Elastomers

Most of the large firms in this industry are foreign-based multinationals (see Table 1). The exception is Nova, which in 1988 acquired the other large Canadian-owned firm, Polysar. Over the last decade and a half the petrochemical industry has had to adapt to a number of significant changes in its environment, their effects substantially mediated

TABLE 1

**Major Firms by Segment of the Industry**
**(Nationality of Majority Ownership)**

| PETROCHEMICALS | PHARMACEUTICALS |
|---|---|
| Nova (Canada) | Multinational Ethical Drug Producers |
| Dow (U.S.) | American Home Products (U.S.) |
| Union Carbide (U.S.) | Merck Frosst (U.S.) |
| Dupont (U.S.) | Johnson & Johnson (U.S.) |
| Shell (Netherlands) | Glaxo (U.K.) |
| | Generic Drug Producers |
| | Novopharm (Canada) |
| | Apotex (Canada) |
| | Horner (U.S.) |

| PLASTIC RESINS | PLASTIC PRODUCTS |
|---|---|
| Nova (Canada) | Canron (Canada) |
| Dow (U.S.) | Scepter (Canada) |
| Dupont (U.S.) | North American Plastics (U.S.) |
| C.I.L. (U.K.) | Woodbridge Foam (Canada) |
| Esso (U.S.) | Waterville Cellular (Canada) |
| B.F. Goodrich (U.S.) | ABC Plastic Moulding (Canada) |
| Shell (Netherlands) | C.I.L. (U.K.) |
| Himont (Italy) | Dupont (U.S.) |
| Borg-Warner (U.S.) | Can. General Tower (Canada) |
| Reichhold (Japan) | I.P.L. (Canada) |
| | Reliance Products (U.K.) |
| | Maple Leaf Plastics (Canada) |

Source: ISTC Country Profiles, *Petrochemicals, Synthetic Resins, Plastics Products, Pharmaceutical and Medicines.*

through government policy. First, feedstock prices increased rapidly as a result of the oil shocks, though federal intervention kept them below world prices.[4] Second, were the subsequent recession and collapse in feedstock prices. Third, the Western Accord of 1985 deregulated oil prices. Fourth, the FTA came into effect.

This industry segment profited from lower feedstock prices in the 1970s and early 1980s. Relative to U.S. producers, most of that advantage is now gone. An advantage remains in energy costs but it

is substantially offset by higher capital and distribution costs.

In response to all these changes the industry has undergone a substantial restructuring process. Some money-losing plants have been closed and the major companies have increasingly concentrated operations into the production of a smaller range of commodity chemicals and related products. Dupont now concentrates on polyethylene and nylon carpet yarn; C.I.L. has increasingly concentrated on urea and the distribution of chemical products; Union Carbide has disposed of some polyethylene operations and expanded its Linde industrial gas business. Investments by Nova's basic petrochemicals division have allowed the company to replace a significant proportion of its crude oil feedstock with cheaper natural gas liquids.[5] This restructuring, combined with sustained economic growth in North America over the past seven years, has brought financial benefit to the industry over the past two years.[6]

The bulk of the industry's trade is with the United States which in 1988 took almost $1 billion of organic chemicals out of total exports of $1.8 billion, and over $800 million of resins and elastomers out of total exports of $1.5 billion (see Figure 8). The EC is a relatively minor export destination for both sets of products ($246 million of organic chemicals and $43 million of resins and elastomers) -- much less important than the Pacific Rim. Note that the heavy dependence on exports to the United States and to other U.S.-dominated export markets makes the industry vulnerable to increases in the value of the Canadian dollar relative to the U.S. dollar.

### 1.2 Advanced Industrial Materials

Reliable aggregate figures on shipments, exports and imports are not available for the advanced industrial materials sector. An initial problem is the considerable variability in the types of products that are included in this sector, most of which would not be considered chemical products. The Canadian Advanced Industrial Materials Forum, for instance, includes "matrix oriented lumber," unitized wall panels, and some improved asphalts for pavement construction. More conventional definitions limit the term to advanced plastics, metals, and ceramics and, in particular, to composites and laminates that combine two or more of these materials. For present purposes the latter definition will be used.

The one area on which partially relevant aggregate data are available is plastics products. The relevant figures appear in Table 2. This is an industry that, according to official statistics, has more than 1 000 plants and more than 50 000 workers. It runs a substantial trade deficit ($891 million worldwide in 1988). Its trade is overwhelmingly concentrated with the United States and only 3 per cent of the three-quarters of a billion dollars of exports it generates go to Europe.[7] Its main products are packaging materials of various kinds, construction materials (vinyl siding, plastic pipe), and automobile parts.

In general, this is not an industry with great international strength. Many of the plants are of an uneconomically small scale and depend heavily on technology licensed from foreign companies. Many have depended for their existence on the tariff barriers that are being dismantled as a result of the FTA. Other plants are unlikely to become major exporters because their products are bulky and therefore expensive to transport. This is an industry likely to be hard hit by the FTA; it will probably undergo a substantial adjustment process over the next decade.

There are, however, areas of strength. Royal Plastics, for example, has been a very successful producer of extruded

**TABLE 2**

**Plastics Products: Principal Statistics, 1982-86**

| | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|---|---|---|---|---|
| Establishments | 943 | 1 086 | 1 143 | 1 172 | 1 180 |
| Employment | 54 650 | 37 027 | 43 058 | 47 712 | 48 000 |
| Shipments ($ millions) | 2 617 | 3 125 | 4 015 | 4 681 | 5 025 |
| Exports ($ millions) | 282 | 328 | 430 | 551 | 726 |
| Imports ($ millions) | 581 | 733 | 931 | 1 075 | 1 193 |
| Exports to EC as % total | | 3 | 3 | 2 | 3 |
| Imports to EC as % total | | 6 | 7 | 8 | 10 |

Source: ISTC Industry Profiles, *Plastics Products*, p. 6. Refers to SIC 3199.

profiles for window and door frames. Scepter is a world-class producer of very large polyvinyl chloride (PVC) pipe. ABC plastics has pioneered blow-moulded large truck components. Woodbridge Foam is a strong producer of automobile seats. These firms, and others like them, can stand up to foreign competition in Canada and might also either export or, where the product in question is too bulky, exploit their expertise through direct investment.

Much of what is technically innovative in plastics products, however, is likely to originate outside the industry (strictly defined). Producers of products for which plastics provide an alternative material are branching into plastics production and, typically, have larger resources to sustain the type of research and development activities or establish the international co-operative arrangements required. Stelco, for instance, has set up a joint venture with a German company to manufacture plastic gas tanks for the automobile industry.

In general, the major actors in Canada in new materials (as defined above) are either firms concerned with losing markets for their regular products to new material substitutes, or firms interested in substituting new materials for metals. Examples of the former are Alcan (which also produces ceramics powders) and Stelco, both of which have experimented with composites, and Noranda which, concerned with the threat to its market for copper wire, became involved with Canstar in optical fibre production.[8] Examples of the latter are automobile assemblers and parts producers (in particular Magna International) that have been fairly aggressive in substituting plastics and plastics composites for metals (although they have so far been rather modestly involved in materials involving ceramics) and Hydro Québec, that has a considerable interest in the conductive properties of some ceramics.[9]

With respect to ceramics, Canada does not have the resources to be at the forefront of the industry over a wide range of products, but has successful producers, or potentially successful producers, in a number of areas. In structural ceramics (materials that are impact-resistant, wear-resistant, or insulate) Hamilton Porcelains has been described as "technologically very strong" and has exported products to the U.S.,

Europe, and Japan.[10] In functional ceramics (materials that exploit an electrical, optical, magnetic, or related property) a number of small firms have successfully produced for the defence industry, but have also suffered from the vulnerability that dependence on a single client implies.

In general, Canadian producers of advanced industrial materials have one important advantage: the production of advanced industrial materials is typically energy intensive and Canada has low energy costs. Canadian producers labour, however, under a substantial disadvantage: a number of other countries -- in particular Japan -- have invested very substantial funds in research and development (R&D) in advanced industrial materials and as a result their firms have a marked technological lead.

### 1.3 Pharmaceuticals

The pharmaceutical industry is divided between a number of large multinationals producing both patented and off-patent, over-the-counter and ethical prescription drugs and a small number of manufacturers of generic substitutes, the two largest of which are Canadian owned (see Table 1). The generic sector grew in response to the Canadian Patent Act of 1969, which provided for the compulsory licensing of generic substitutes for patented ethical drugs in exchange for a 4 per cent royalty payment to the patent holder. Bill C-22 was passed in 1987 and dramatically changed the situation. On new products it gave brand-name manufacturers 7 to 10 years' protection against generic substitutes. The industry is still adjusting to these changes.[11]

The industry has the following characteristics. First, very little of the fine chemicals that are the primary active ingredient of pharmaceuticals are produced in Canada. These are usually manufactured in the country of origin of the multinational, at important market locations, and in parts of the world that combine low labour costs with generous tax treatment of foreign investors (e.g. Ireland, Puerto Rico).[12] Second, Canadian plants are largely oriented to the Canadian market and operate on what, by international standards, is a rather small scale.[13] Thus, while pharmaceuticals account for a larger share of chemical industry factory shipments than resins and elastomers (Figures 1 and 2), they have a small export presence (Figure 8). In 1988 the industry exported products worth $175 million, as compared to factory shipments of $1.7 billion. Of those exports, less than $31 million went to EC countries.

The FTA may modify this situation somewhat. Part of the Canadian output can qualify for tariff reduction under the FTA rules of origin. This is the case if the costs of materials of North American origin plus the direct cost of processing in the territory constitute 50 per cent or more of the value of the finished product when exported. However, a product cannot qualify for free trade treatment if manufactured by taking a medicine of third country origin made of two or more constituents already mixed for therapeutic or prophylactic uses and preparing it in a measured dose or form for retail sale.[14] The FTA is expected to have a modest effect on the export activities of the Canadian pharmaceuticals industry.

Bill C-22 and the FTA have changed and will continue to change the circumstances of the Canadian pharmaceuticals industry. In addition to these particular changes there are other changes that apply to the industry worldwide. First, governments throughout the world are attempting to control spiralling health care costs, of which prescription drug costs are a major component. Second, a substantial proportion of profits in the industry has been based on a number of products patented in the early 1960s. In fact, over half of the 50 most prescribed drugs

today were invented 15 or more years ago and it has been argued that "most new drugs introduced recently offer fewer benefits over older drugs" than was the case in the past.[15] Consequently, a range of patented and still widely prescribed drugs will be becoming available to generic manufacturers over the next few years. In response to this circumstance some of the multinationals engaged in the production of patented ethical products have begun to move into the production of generic substitutes. Third, the emphasis in the industry by therapeutic category is likely to shift. The aging population of rich countries means an increasing demand for cardiovascular and mental health products. The growing income in some parts of the developing world will produce increased sales of anti-infective drugs. Fourth, the most likely source of product innovations over the next several decades is biotechnology. The development of products through modifications to living organisms is accentuating pharmaceutical company involvement in basic research.[16]

### 1.4 Biotechnology

There are about 220 organizations involved in industrial biotechnology in Canada, spending in 1986 over $359 million on R&D.[17] Worldwide, the principal biotechnology sector is pharmaceuticals (68 per cent of the market). Food and agriculture account for another 24 per cent. Biotechnology is, of course, most relevant to agriculture as a source of livestock and plant improvements. But the range of its possible uses in this industry is wider. For example, developments in the biotechnology of fertilizers, especially soil incubants such as nitrogen-fixed bacteria and similar products are of potential commercial significance. Early work on this by the Saskatoon-based company, Microbio Rhizogen Corp., led to its purchase by the U.K. company, Agricultural Genetic. Canada has some strength in both pharmaceutical and agricultural biotechnology.

However, its area of most probable relative advantage lies elsewhere. Biotechnology can be used in the natural resource-related industries in which Canada has great strength. It has applications in forestry (in particular, genetic improvements in trees and the development of biological pesticides), the extraction of minerals from ore (bioleaching), and pulp and paper manufacture (the use of bacteria as whitening agents, detoxification of waste water).[18] It also has promise in other pollution-control uses, in which Canadian companies might have some experience and thus could have a relative advantage.

These, however, are areas in which the commercial applications of biotechnology have been generally modest. It is in medical applications and plant genetics that commercial application of biotechnology has been most frequent. Even in medical applications, biotechnology has been slower to generate new therapeutic products than was anticipated in the recent past.[19] Interestingly, the area of medical biotechnology with the greatest commercial success is the development of novel diagnostic kits.[20] This is an area in which Canada has successful small companies (ADI Diagnostics, APO Diagnostics, IAF Biochem International, Biomira, Canadian Bioclinical) and some exports to Europe.

The other currently commercially viable sector of medical biotechnology is the manufacture of vaccines and immunostimulants. Canada has successful exporting firms in these areas for applications to both humans (Connaught Bioscience) and animals (Vetrepharm).

## 2. THE EUROPEAN CHEMICAL INDUSTRY

Chemicals, including almost all the relevant components of the broad industrial category, is an area of considerable European strength. Table 3 is somewhat difficult to interpret since the EC countries covered by the data vary somewhat from series to series and from year to year. However, the position of the industry is clear. EC production exceeds that of Canada and the United States combined (Figure 9). The process of restructuring after the recession allowed production to rise while total employment in the industry remained more or less static. Capital investment rose rapidly after the recession of the early 1980s. And the EC industry as a whole runs a continual trade surplus with the value of exports approximately double the value of imports.

**TABLE 3**

**EC Chemical Industry: Main Indicators, 1980-87**
**(Production, Investment and Trade in Million ECU)**

| | Total Production | Total Investment | Extra-EC Exports | Extra-EC Imports | Employment (1 000) |
|---|---|---|---|---|---|
| 1980 | 155 600 | 7 426 | 27 329 | 12 665 | 2 097 |
| 1981 | 174 404 | 7 512 | 32 923 | 14 029 | 2 040 |
| 1982 | 183 703 | 7 457 | 34 273 | 15 884 | 1 961 |
| 1983 | 199 780 | 7 886 | 39 581 | 18 167 | 1 912 |
| 1984 | 209 641 | 8 218 | 47 705 | 22 099 | 1 905 |
| 1985 | 223 219 | 10 553 | 49 136 | 24 642 | 1 905 |
| 1986 | 199 162 | 12 024 | 51 656 | 25 331 | 1 910 |
| 1987 | N/A | 12 782 | 45 883 | 23 591 | 1 908 |

Source: *Panorama of EC Industry 1989* (NACE 485).

N/A: Not applicable.

Note: The series for total production and employment exclude (i) fibres; (ii) Portugal; (iii) for 1984 and 1985 Spain; (iv) for 1986 Spain, Netherlands and Greece. The series for total investment (i) includes fibres for the U.K., West Germany, Netherlands, Denmark, Italy, Portugal; (ii) includes rubber and plastics manufacturing for Belgium, Spain; (iii) excludes Portugal for 1986; (iv) excludes Portugal and Ireland for 1987. The series on trade (i) excludes Greece; (ii) includes Spain and Portugal in 1985 and 1986 alone; (iii) includes fibres for the U.K., West Germany, Netherlands, Denmark, Italy, Portugal; (iv) includes rubber and plastic manufacture for Belgium and Spain.

The European industry has two main sources of strength. First, Europe-based chemical companies have substantial resources. Of the largest 20 chemical companies in the world, 15 are European. Of those 15, there are 11 based in EC countries and the remaining 4 are in EFTA countries, which gives them privileged access to the EC market (Table 4). Second, there is a widespread view that European chemical companies have a technological edge on their North American competitors. This view is held in Europe.[21] It was also a view expressed by company executives in the plastics and pharmaceuticals industries interviewed for this study.

As well as producing increased output with a constant or declining labour force, the restructuring of the EC chemical industry has a number of other notable characteristics. First, there has been a series of mergers, in particular in countries with smaller chemical

**TABLE 4**

**The 20 Largest Chemical Companies in the World, 1987**

| Company | Country | 1987 Sales (billions of dollars) |
|---|---|---|
| BASF | W. Germany | 25.6 |
| Bayer | W. Germany | 23.6 |
| Hoechst | W. Germany | 23.5 |
| ICI | Britain | 21.0 |
| Du Pont | U.S. | 17.6 |
| Dow Chemical | U.S. | 13.4 |
| Ciba-Geigy | Switzerland | 12.4 |
| Montedison | Italy | 11.9 |
| Shell | Holland/Britain | 11.7 |
| Rhône-Poulenc | France | 10.6 |
| AKZO | Holland | 8.8 |
| Monsanto | U.S. | 7.6 |
| Exxon | U.S. | 7.2 |
| Sandoz | Switzerland | 7.1 |
| Union Carbide | U.S. | 6.9 |
| Solvay | Belgium | 6.8 |
| Roche Sapac | Switzerland | 6.1 |
| EniChem | Italy | 5.3 |
| Norsk Hydro | Norway | 5.3 |
| DSM | Holland | 5.1 |

Source: *The Economist* (16/7/88), p. 69.

companies. In Spain, for instance, the state oil company, EMP, forced the merger of four petrochemical companies with which it was engaged in joint ventures -- Alcudia, Paular, Calatrava, and Montoro.[22] Second, large companies have traded assets or formed joint ventures to increase their scale and competitiveness in narrower lines of business. ICI exchanged its polyethylene plants for BP's PVC plants; ENI and Montedison pooled their bulk chemicals operations, and SNIA, Italy's third-largest chemicals producer, is likely to join the venture later.[23] Third, a significant number of European chemical firms have substantially reoriented their business away from commodity chemicals to specialty and fine chemicals. ICI reports that 60 per cent of its sales come from specialty chemicals (up from 35 per cent in the 1970s), and it is estimated that most European chemical firms are targeting a specialty chemical share of business of about 70 per cent.[24] Fourth, EC chemical firms have been deliberately expanding sales outside Western Europe, in particular in the United States. Italian firms have tended to set up joint ventures. Enichem, the Italian state-owned chemical company has set up joint ventures with Dow, Du Pont, Union Carbide and UniRoyal. ICI, Hoechst, BASF, and Rhône-Poulenc have all invested heavily in U.S. acquisitions.

The typical European chemical producer now has 20 per cent of its sales in the United States, 80 per cent of which are supplied by local U.S. plants.[25] Fifth, within the EC investment has moved from the richer countries with strong chemical industries (West Germany, France, and the U.K.) to the less rich countries with weaker chemical industries (Spain, Portugal and Greece).[26]

### 2.1 Plastics

Table 5 shows that during the recession of the early 1980s European plastics production fell, in part because substantial amounts of plant were scrapped, in particular in West Germany and the U.K. But the industry has rebounded strongly and is expected to continue to do so into the early 1990s. Plastics production is particularly heavily concentrated in West Germany, which accounts for more than one-third of the tonnage produced.

**TABLE 5**

**EC Plastics Production: Total and Selected Countries (in thousands of tonnes)**

| | 1979 | 1982 | 1987 | 1993 (Forecast) |
|---|---|---|---|---|
| EC total | 20 800 | 19 280 | 24 632 | 30 500 |
| W. Germany | 7 240 | 6 274 | 8 392 | 10 626 |
| France | 3 213 | 3 110 | 3 863 | 4 610 |
| Italy | 2 450 | 2 160 | 2 780 | 3 280 |
| U.K. | 2 918 | 2 163 | 1 990 | 2 300 |
| Spain | 1 189 | 1 195 | 1 560 | 2 100 |

Source: *Europe in 1993: Economic Outlook by Sector*, BIPE, Paris, 1989, p. 241.

The bulk of the growth in industry production during the 1980s has been concentrated in technical plastics -- that is, in plastics developed for specific uses and manufactured to generally high quality standards.[27] The production of standard plastics has also expanded and may be expected to continue to do so on account of the wide dispersal of plastics consumption within the EC. The per capita consumption of plastics in West Germany is almost three times the per capita consumption in Spain and more than twice that of France, the U.K. and the Netherlands.[28] There is, therefore, room for a much broader use of, and demand for, standard plastics in a number of EC countries. But the largest growth in demand will be for technical plastics.

As in chemicals as a whole, Europe is a major international player in plastics. In standard plastics the volume of EC output is a little larger than that of the U.S. and more than twice the output of Japan.[29] More important, the EC is responsible for two-thirds of total plastics exports of the Organization for Economic Co-operation and Development (OECD), the F.R.G. alone producing more than one-fifth. The plastics industry is also important to the EC in that it accounts for an unusually high proportion of total EC exports. Whereas plastics accounted for 3.8 per cent of total EC exports, they only accounted for 2.3 per cent of U.S. and 1.4 per cent of Japanese exports. However, against this export strength (and dependence and vulnerability) must be set the apparent weakness of the EC in recent plastics inventions. The U.S., with a large chemical industry with much of its output consumed in its domestic market accounted for almost 38 per cent of world patented inventions, more than 4 per cent more than the EC. The relevant figures are presented in Table 6.

Since the European chemical industry has flourished during the sustained expansion of the past five years, it has accumulated substantial financial reserves and is well equipped to confront future challenges. Central among those challenges will be its response to a number of regulatory initiatives. In particular, both in the politics of several of the individual countries and in the politics of the EC as a whole, there is great concern with the effects of contact with plastics on the quality of food and medicine, with the fire safety of plastics, and with the ecological aspects of plastics use. For the foreseeable future, a substantial part of the technological efforts of the industry can be expected to be directed towards these concerns.

### 2.2 Advanced Industrial Materials

Advanced industrial materials is not an area on which useful aggregate data are available. The production and export figures on advanced fibre reinforced composites (e.g. carbon fibre products) are buried within the figures for fibreglass production for marine and other recreational uses. The figures on ceramics include various kinds of tableware, tiles, drainage materials, etc.[30]

However, the following observations are possible. First, the European strength in synthetic resin manufacture gives European countries a strong technological base in the development of advanced plastics and plastics composites. Second, countries with strong defence industries within the EC, such as France and the U.K., and Sweden within EFTA, have a strong, heavily government-subsidized base for the development of advanced industrial materials. Third, in advanced ceramics, there is some sense that Europe lags behind the United States and Japan.[31] Fourth, as a complement to the 1992 program, the EC has established the Basic Research in Industrial Technologies

**TABLE 6**

**Competitive Position of Plastics Producers**

| Country | % Shares in OECD Exports, 1986 | Plastics as % Total Industrial Exports, 1986 | % Shares in World Inventions 1982-86 |
|---|---|---|---|
| W. Germany | 23.1 | 3.7 | 19.4 |
| U.K. | 5.9 | 2.6 | 5.7 |
| France | 8.9 | 3.4 | 4.2 |
| Italy | 6.5 | 2.7 | 2.0 |
| Spain | 1.4 | 2.5 | 0.1 |
| EC 12 | 67.8 | 3.8 | 33.6 |
| U.S. | 9.8 | 2.3 | 37.7 |
| Japan | 8.1 | 1.4 | 23.2 |
| Switzerland | 2.1 | 2.0 | 1.9 |
| World | N/A | 2.7 | 100.0 |

Source: *Europe in 1993: Economic Outlook by Sector*, BIPE, Paris, Table 3.

N/A: Not applicable.

Note: Inventions included in total where patent exists in at least two countries. Export series for EC excludes Spain, Portugal and Greece.

for Europe/European Research on Advanced Materials (BRITE/EURAM) research and development program through which the Community will cover 50 per cent of the R&D costs of approved projects jointly undertaken by companies in at least two different Member States. This will do much to marshal European resources at an EC level and achieve a high level of international competitiveness.

Some areas of European strength in advanced ceramics already exist. Germany, Sweden, the U.K., and France (in that order) are the technological leaders in this area in Europe. Their leadership is based on industries in which they have strength and for which ceramics promise particularly useful applications -- specifically, the automobile industry, atomic energy generation, as refractories in metal refining, and in defence products.[32]

### 2.3 Pharmaceuticals

The pharmaceutical industry includes drugs for application in human and veterinary medicines and related preparations such as vitamins and hormones, diagnostic products, vaccines and homoeopathic products. The five largest EC countries account for a little less than 80 per cent of community pharmaceutical production, and of those five countries, France and West Germany are the most important (see Table 7).

**TABLE 7**

**EC Pharmaceuticals, 1987**

| Country | Production (in millions of ECU) | Share % |
|---|---|---|
| W. Germany | 10 338 | 26.7 |
| France | 9 149 | 23.6 |
| U.K. | 6 971 | 18.0 |
| Italy | 5 152 | 13.3 |
| Spain | 2 813 | 7.3 |
| EC 12 | 38 700 | 100.0 |

Source: *Europe in 1993: Economic Outlook by Sector*, BIPE, Paris.

The EC has an internationally important pharmaceutical industry. But its international weight is felt less in this sector than in plastics. One might even speak of a certain vulnerability that the changes involved in Europe 1992 are designed to remove. The relevant changes are discussed later in this document. This section outlines some of the sources of weakness in the EC pharmaceutical industry.

. The most fundamental source of weakness is the fact that, even 30 years after the Treaty of Rome, EC producers confront a fragmented market. Differences in drug licensing procedures, labelling, and packaging have limited intra-EC competition, as have variations in national pricing regimes. In West Germany and, to a lesser extent, the Netherlands and Denmark, prices are fixed by the government. In the U.K. profits are regulated. Prices in Ireland are, in practice, tied to those of the U.K. In France and Belgium businesses can in principle set their own prices but in practice are limited by the reimbursement rates set by the health care administrations. In Greece, Italy, Portugal, and Spain there is regulation of price mark-ups over costs. That these complicated structures have been used quite deliberately to protect domestic markets is recognized by the EC Commission itself. It has been admitted that the system creates discriminatory effects: it is sometimes used to favour local firms and may provoke a useless decentralization of some activities along with the subsequent loss of scale economy.[33]

This complex of regulations has produced wide variations in pharmaceutical prices by EC country, and wide variations in the weight of drug costs in total health care expenses, as Table 8 shows. It has also produced an industry with production facilities duplicated across EC countries, often owned by foreign enterprises.[34]

. The EC pharmaceutical industry has a substantial export presence. Production originating in EC countries accounts for over 58 per cent of total OECD exports and pharmaceuticals account for almost 2 per cent of total EC industrial exports (see Table 9). This substantial

## TABLE 8

### EC Pharmaceutical Prices and Health Care Expenses

| | Index of Prices in 1985 (EC 9*=100) With Tax | Index of Prices in 1985 (EC 9*=100) Without Tax | Sales as % Health Costs |
|---|---|---|---|
| Belgium | 83 | 85 | 8.6 |
| Denmark | 140 | 123 | 7.0 |
| W. Germany | 157 | 148 | 11.0 |
| Greece | - | - | 20.2 |
| Spain | - | - | 12.1 |
| France | 66 | 66 | 8.8 |
| Ireland | 116 | 124 | 8.8 |
| Italy | 69 | 68 | 12.4 |
| Luxembourg | 84 | 85 | - |
| Netherlands | 136 | 139 | 4.1 |
| Portugal | - | - | 18.9 |
| U.K. | 91 | 97 | 9.6 |
| EC 12 | - | - | 9.5 |

Source: *Economie Europeenne*, No. 35 (March, 1988), p. 73.
* EC less Greece, Spain and Portugal.

## TABLE 9

### Export and Invention Performance in Pharmaceuticals, 1986

| | % Share in OECD Exports | Pharmaceutical Exports as % Total Industrial Exports | Share in World Inventions 1982-86 (%) |
|---|---|---|---|
| W. Germany | 16.5 | 1.5 | 13.7 |
| U.K. | 11.3 | 2.9 | 11.4 |
| France | 10.1 | 2.2 | 6.4 |
| Italy | 5.2 | 1.2 | 3.3 |
| Spain | 1.6 | 1.7 | 0.6 |
| EC 12 | 58.3 | 1.9 | 38.1 |
| U.S. | 16.2 | 2.2 | 35.5 |
| Japan | 2.6 | 0.3 | 16.7 |
| Switzerland | 11.9 | 6.7 | 3.2 |
| World | - | 1.5 | 100.0 |

Source: *Europe in 1993: Economic Outlook by Sector*, BIPE, Paris, p. 126.

Note: Inventions included in total where patent exists in at least two countries. Export series for EC excludes Spain, Portugal and Greece.

export presence is evidence of industry strength; but it is also a source of vulnerability. Industry performance depends on its ability to hold on to market share in the face of increased competition from Japanese and, in particular, North American and Swiss pharmaceutical firms. Within the EC there is considerable anxiety about increased foreign competition.[35] That there are probably grounds for this anxiety is suggested by the fact that, though the EC continues to have a substantial excess of extra-EC exports over extra-EC imports, the relative magnitude of that surplus has been declining. The ratio of exports to imports fell from 2.48 in 1980 to 2.06 in 1987.[36]

- The performance of most pharmaceutical firms is closely tied to their success in R&D. The European industry engages in a substantial research effort: it currently invests about 4 billion ECU in research. And, as Table 9 shows, this research has paid off in a significant share of world pharmaceuticals inventions. But there is evidence of a decline in the relative R&D performance of the European industry in general, including the EC industry. This can be seen clearly in Figure 10. It shows that while the U.S. industry has tended to hold its position as a producer of new molecules, Europe's relative share has declined as Japan has improved its position in the pharmaceutical industry.

The EC pharmaceutical industry, then, remains a powerful world presence, but one that has been weakened somewhat by the fragmented domestic market it faces, and one that seems to be losing some of its export and R&D dominance. EC producers also complain of inadequate patent protection. The effective life of patents granted within the EC has been substantially shortened by the time required to develop a drug from patentable status to the point where testing for regulatory approval can begin, and by delays in drug registration procedures. This has become a major industry concern.

There is, then, a preoccupation within the European industry with the challenge of North American and, increasingly, Japanese producers. Part of the response to this challenge by European industry leaders is a conviction that European firms have to expand into the North American market, by acquiring North American firms. Two main reasons are given for this strategy. The first is the argument that the research costs for many new drugs are so high that it is necessary to assure as large a market as possible for those drugs that are finally marketed. The second is that European pharmaceuticals firms lack skill in tailoring sales to regional markets. The regulatory environment of the European industry has produced a set of country-based firms (including numerous subsidiaries of foreign-based firms, some of them based in other EC countries) directing sales at national markets. North American firms have more experience in regional marketing and it is thought that their acquisition will allow European sales forces to learn regional marketing skills.[37]

### 2.4 Biotechnology

A number of factors have hampered the development of biotechnology in Europe. There is the diversity in regulatory regimes and patent law systems (discussed below). There was also a problem with the price of fermentation feedstocks (starch, sugar) caused by the EC's income support program for agricultural producers. Thus, the restrictive quota on isoglucose production in the Community meant that one major application of enzyme technology -- the liquid sweetener -- was commercially exploited in the United States, despite the fact that many of the key innovations were made in Europe.[38] This latter problem was finally addressed

through a program of refunds to chemical manufacturers to compensate them for higher carbohydrate prices.[39] But it is widely thought to have set back the development of biotechnology in the EC which, on balance, lags behind the U.S. and Japan.[40]

A number of regulations generated as part of Europe 1992 are specifically addressed to this sector. Regulations have been proposed on common approval processes, on market exclusivity, on what can be patented and when, on the containment of genetically modified micro-organisms and on the release of such entities into the environment. The regulations on labelling, procedures for non-clinical testing and worker protection also apply to this section. By providing a predictable, pan-European set of standards these regulations are likely to strengthen the EC industry and to increase the pay-off from the pan-European program of biotechnology R&D subsidies.

## 3. EUROPE 1992: IMPLICATIONS FOR THE CANADIAN CHEMICAL INDUSTRY

### 3.1 The Changes

The trade liberalizing effects of the removal of tariffs on goods traded within the EC have, to a substantial extent, been offset by a variety of non-tariff barriers. In fact, these may even have become more acute as the governments of EC countries have tried to find ways to preserve national industries and jobs. Europe 1992 is designed to remedy this situation and involves the policy areas listed below.

#### a) Administrative Delays at Borders

Cross-border trade within the EC is to be simplified by reducing and standardizing customs procedures at borders and by standardizing product-specific labelling and packaging regulations.

#### b) Taxes

On most products, excise and VAT rates vary considerably among EC countries. This variability hinders cross-border trade since it requires administrative arrangements to assure that the relevant taxes are paid to the appropriate country, at the appropriate rate. The EC Commission has proposed to deal with this through standardization of excise taxes within the EC and convergence of the VAT rates of member countries to specified ranges -- probably including a range for standard rates and a range at a much lower level (possibly as low as 0 per cent) for specified products.[41]

#### c) Product Standards and Technical Regulations

The EC 1992 policy of harmonization and mutual recognition of product standards and certification could have implications for the acceptance of Canadian chemical products in the EC. In general, EC directives establish essential health, safety and other requirements for mutual acceptance of products in all Member States leaving development of detailed European standards incorporating these requirements to designated European organizations (such as the Comité européen de normalisation [CEN]). A European organization is being established to co-ordinate negotiation of agreements between Member States for mutual recognition of certification and testing in individual industrial sectors.

How are Canadian chemical products likely to be affected by this policy? Chemical products are not covered per se by essential requirements in EC directives except indirectly by directives on marketing and composition of fertilizers, detergents; construction products; good laboratory practice; labelling of cosmetic products; and marketing, packaging and labelling of dangerous substances. In the absence of such requirements, chemical products would be accepted for circulation in all Member States without being subject to mandatory technical requirements. Should such requirements be adopted, chemical products would only need to comply with specifications in CEN standards reflecting essential requirements as a condition for circulation throughout the EC.

Opportunities exist for Canadian companies to have access to information on CEN standards being developed for products whether or not covered by EC regulations. Companies with subsidiaries or agents in the EC would have access to proposed CEN standards through Member States representation in the appropriate CEN technical committee. Other companies could receive information on CEN work programs and copies of draft standards through the Standards Council of Canada which operates a standards

database on EC 1992 on behalf of External Affairs and International Trade Canada. Canadian companies could also provide views on the proposed standards to the Council for transmission to CEN before the standards are adopted in Europe (i.e. during the 60-day public comment period on proposed CEN standards).

At the same time, pharmaceuticals would be subject to common approval, clinical evaluation and testing requirements under EC directives for registration in all Member States. The EC has adopted directives on procedures for considering applications for market authorization, i.e. licensing, of proprietary medicinal products as well as for analytical, pharmacological, toxicological and clerical protocols for testing such products. These directives are also intended to shorten the current four- to six-month period for technical evaluation of applications for product licensing. Applicants in the EC could supply results of tests and clerical trials. In cases where a product is similar to one already authorized, the EC would allow applicants to limit submissions to a summary dossier of bibliographical information.

Applications are processed under authority of special EC committees. EC directives on pharmaceuticals could facilitate access for Canadian products through common procedures. Implementation would be the responsibility of regulatory authorities and would not involve standards organizations.

**d) Transparency**

As we saw earlier, EC governments play a major role in determining pharmaceutical prices. In some instances the reimbursement policies of health services determine whether or not a drug can be sold at all. National pricing and reimbursement policies appear to have been used in the past to discriminate in favour of national producers. The EC method for eliminating this non-tariff barrier is through a directive on "transparency" of Member State decisions on the prices of medicines and on social security refunds.

It requires: i) tight deadlines for discussions on marketing authorizations, pricing decisions, and access for pharmaceutical products to the reimbursement list; ii) justifications for decisions in forms that can be objectively verified; iii) the establishment of a data bank containing a summary of the characteristics of each drug product and its retail price.[42]

**e) Intellectual Property**

Three broad areas of concern affect intellectual property. First, there is the counterfeiting of brand-name goods, which includes everything from pharmaceuticals to running shoes.[43] Through a series of directives dealing with trademarks the EC commission has moved fairly aggressively to reinforce intellectual property rights in this area.[44] Second, there is the modification of intellectual property law to accommodate the specific properties of new technology. Particularly relevant here are protections for biotechnological inventions. These are dealt with in the proposed directive COM(88)496 which, among other things, makes some progress in defining what is patentable (e.g. which surgical animal treatments are regarded as therapeutic and therefore not patentable and which are non-therapeutic and therefore patentable), and also clarifies the procedures for establishing the novelty of a procedure or some biological material. Third, there is the issue of the speed with which patents are granted.

Some concern has been expressed over whether EC intellectual property law will be enforced in a non-discriminatory fashion.[45] Certainly, the text of the

proposed directive on biotechnology makes clear that international agreements supersede EC policies. In general, the proposals and directives dealing with intellectual property from the EC Commission seem consistent with multilateral efforts at the Uruguay Round of the General Agreement on Tariffs and Trade (GATT), and elsewhere. At the same time, however, the EC directives modify but do not completely supplant the intellectual property law of EC Member States. They probably make it more difficult for Member States to discriminate against other countries, and against non-EC countries in particular, but they do not make it impossible.

**f) "Social" Europe**

As a trade-off for the competition-enhancing character of Europe 1992, a set of measures has been proposed that will benefit labour. The proposals include strengthened legislation on worker health and safety; employment benefits for part-time workers; a European social charter establishing worker rights in collective bargaining, access to employer information and rights to consultation on specified issues; a change in company law requiring labour participation in management decision-making; and changes in laws that give workers the right to move freely between Member States.[46]

**3.2 "Presence" or "Non-Presence"**

**a) Companies "Present" in the EC**

The large commodity chemical companies operating in Canada (Nova, Dow, Dupont, etc.) and the large foreign-owned multinational pharmaceutical companies (American Home Products, Merck Frosst, Johnson and Johnson, etc.) all have European production operations, as do some smaller firms. Because they have subsidiaries that qualify as "EC firms" or that can, relatively easily, have their legal status changed so that they will qualify, these companies are likely to directly benefit from Europe 1992's trade liberalizing effects.

In journalistic treatments emphasis is usually placed on the harmonization of product standards Europe 1992 will bring. But, with the exception of the pharmaceutical industry, for the industry representatives interviewed for this study the most frequently cited benefit of Europe 1992 was the simplification it will bring in intra-EC transportation (including standardized packaging and labelling regulations). There are two reasons for this. First, cross-border delays caused by cumbersome customs procedures in Europe are a major concern. Second, while there is some suspicion that much less harmonization of product standards will actually be accomplished than is promised, there is widespread confidence that simplified cross-border trade and harmonization of packaging and labelling will be delivered.

In fact, the competitive position of Canadian firms that supply EC countries from subsidiaries is likely to be strengthened relative to firms that only export to the EC. There are two reasons for this. The first is that firms with subsidiaries are likely to have superior information about the changes and opportunities relevant to their particular kinds of products and will therefore be well positioned to profit from the acceleration in aggregate economic growth likely to be produced by Europe 1992. The second is that firms with subsidiaries in the community are likely to have the best information about and influence over product standards and other matters of Community policy. They will be eligible to be consulted over detailed Community-wide standards formulated by the CEN and will receive early notification of standards once they are set.

These advantages will be partially offset by the fact that non-EC firms incorporated in EFTA countries may also be effectively treated as EC members

and, for those companies with production facilities in low labour cost countries (in particular Spain, Portugal and Greece), there may be a decrease in labour flexibility as a result of "social" Europe. But these drawbacks are unlikely to completely offset the benefits of "presence."

**b) Companies "Not Present" in the EC**

The net effects of Europe 1992 for firms without European subsidiaries are less clear. They will depend on the form of the trade link with Europe, if any.

- Companies that do not have a subsidiary in an EC country will usually be less well informed about changes and opportunities in the industries. However, if 1992 unfolds as the Commission intends, only one product test would be required within the EC, and this, of course, could be carried out in Canada should Canada wish to negotiate an appropriate agreement for mutual recognition of product testing and certification.

- Access to information on standards and the problems involved in having Canadian products accepted as conforming to EC standards are unlikely to be any worse after 1992 than they are now and may be considerably improved. (In some sectors of this industry, in particular pharmaceuticals, the problems of obtaining licences in some EC national markets are described as "horrendous.")

- Some spillover of liberalized trading arrangements for recognized EC firms to extra-EC firms is likely. For example, it would take a fairly determined (in fact, improbably) protectionist European government to refuse the application of harmonized packaging and labelling rules to non-EC countries.

- The deliberations of CEN will, at least some of the time, produce product standards that conform to those produced by international standards bodies. Both the U.S. and Canadian governments are monitoring the EC standards-setting process carefully. The dependence of most EC countries on the North American market means that Canadian and U.S. preferences can hardly be ignored. Indeed, one trade association representative interviewed expressed the view that, on the standards-setting process, Canada's interests are likely to be indirectly protected by American lobbying. Furthermore, even if EC firms qualify for early notification of CEN decisions Canadian exporters will have access to the same information soon after because of the CEN/Standards Council of Canada agreement.

- Canadian firms without subsidiaries in Europe are likely to profit from the general acceleration of EC economic growth after 1992.

- Europe 1992 is likely to produce some even more formidable European competitors both inside and outside Europe. Furthermore, as it stands, much of the chemical production in these industries in Canada uses technology licensed from elsewhere, including Europe. As European firms acquire greater resources as a result of growth stimulated by the creation of the Single Market some may decide to produce for other markets themselves rather than license their technology to other producers. This may lead them (according to one trade association representative) either to fail to renew licences to Canadian producers for production on the Canadian market or to refuse to license production for markets other than North America and Europe, in particular, the growing Asian market.

On balance, then, the likely effects of Europe 1992 for Canadian firms without subsidiaries in Europe are likely to be mixed. Those that depend on licensed technology may have some problems over the next decade. Other firms are unlikely to be worse off than they are now. In general, the more experience a firm has in Europe, the better off it is likely to be. Firms that already export to Europe are in a better position than those that do not. Those firms that have established marketing arrangements with European firms (e.g. reciprocal marketing of product lines) will be even better off since they have both experience and a source of supportive advice and influence. But it remains the case that the firms in the best position are those with production facilities within the EC.

### 3.3 The Component Industries in Detail

#### a) Chemicals, including Resins and Elastomers

*Commodity chemicals.* Commodity chemical production in Canada is concentrated in a small number of large companies, principally foreign-owned multinationals. These companies have resources, experience and, in most cases, European divisions, which means they are well equipped to preserve their position in the post-1992 European market. Whether the foreign-based multinationals respond to Europe 1992 with decisions that favour production in Canada depends on the capacity of Canadian divisional managements to secure corporate product mandates for export markets.

These companies are unlikely to run into serious problems with changing European product standards. It is true that the initiatives to change EC standards come from European companies, which gives them something of a lead.[47] But U.S. multinationals, most of which are present in Canada, also have representation on the Conseil européen des fédérations de l'industrie chimique (CEFIC), which will be marginally involved in the process of finalizing standards.[48] Furthermore, Europe and the United States are sufficiently mutually dependent in trade in chemicals to make a trade war in this sector mutually undesirable. The Free Trade Agreement means that Canada's chemical industry product standards will be increasingly harmonized with those of the United States and in this industry the interests of United States-based companies are well represented in Europe. Finally, this is an industry in which European firms are internationally very strong. Consequently, there will be less European pressure for protectionist decisions. It is likely that in this industry product standards will tend to be internationally acceptable.

In commodity chemicals, however, there is no reason to expect that Canadian companies will see dramatic improvements as a result of Europe 1992. First, the advantages in feedstock and energy prices of the Canadian relative to the European industry have largely evaporated. Second, the Canadian industry is still adapting to the FTA and the U.S. market is likely to capture the attention of Canadian producers for some time to come. Third, as we saw earlier, the Pacific Rim is a much more important offshore export market than Europe. Fourth, there are important and growing chemical markets within Canada. For example, the use of chemicals by the pulp and paper industry is increasing and will provide a strong demand for some chemical products.[49] The producers of commodity chemicals in Canada are unlikely to be harmed by Europe 1992: Nova and the foreign multinationals will probably profit from some of the growth it generates. But it is unlikely to produce a substantial diversion of trade to Europe in the near future, since Canadian producers have a better relative advantage in other markets.

*Specialty chemicals*. At first sight, in terms of potential for exploiting the European market, specialty chemicals appears to be a distinctly unpromising area. It is an area in which Canada has a massive trade deficit, in which European firms are already internationally strong, and into which the leading European firms have been diverting substantial investment. Furthermore, the weakness of the Canadian pharmaceutical industry (multinationals carrying out low value-added operations in Canada) means that fine chemical production in Canada is negligible, and incentive to develop such production has been lacking.

However, this may well be a sector where Europe 1992 provides a number of opportunities. First, the development of the Canadian specialty chemicals industry has been hampered by problems of scale. The FTA makes possible larger scale operation and establishes the conditions for the development of internationally competitive firms in this area. Second, some Canadian firms already sell successfully into Europe. For example, both Alkaril and Domtar export surfactants to Europe (in the case of Domtar, from a New Jersey plant). Third, multinationals have had some success in securing world product mandates for Canadian divisions. For example, Dupont Canada produces a specialty resin for export. Fourth, space, which Canada has in abundance, remains an advantage in industrial production in general and chemical production in particular.

Specialty chemicals is an area in which there is slightly more likelihood of profitable openings in the EC market than the current weakness of the industry in Canada would suggest. As compared to European firms in the industry, Canadian producers have somewhat lower raw material costs but higher labour costs. But Canada's space advantage, along with the current reorganization of the chemical industry in response to the FTA, is likely to provide some opportunity for sales to Europe by Canadian-owned firms, although the amounts involved are likely to be small.

These same factors -- space and the FTA -- are also likely to provide strong incentives for European firms to invest in Canada, to gain access to the North American market. Investment by EC firms in Canadian production facilities will likely be the surest means to increased EC/Canada economic links over the next decade.

**b) Advanced Industrial Materials**

While there are exceptions to the following generalizations, in general the Canadian plastic products industry is weak; Canadian industrial activity in ceramics and related composites and laminates is very modest; and in neither area is there a significant volume of exports to Europe.

As we saw earlier, there is some strength in advanced industrial materials, largely located in firms that might lose markets to new materials (metals manufacturers) or in firms that are potential users (automotive firms). Canada also has strong firms producing the equipment for manufacturing plastic goods (e.g. Husky Injection Molding Systems) and they may have some interest in extending into plastic product development. It is conceivable that these firms could generate advanced industrial materials that could be profitably sold in Europe. In particular, Canadian firms have an energy cost advantage that is important in the manufacture of new materials, especially ceramics. But, on balance, this is an area in which few Canadian firms are well positioned to exploit the opportunities of Europe 1992. The European plastics industry is itself very strong; in ceramics, Japanese and U.S. firms have a technological lead and are

therefore better positioned to capture future EC market growth.

Europe 1992 is likely to have a more substantial effect on the Canadian economy by encouraging European firms in this area to invest in Canada. There are two forces encouraging such investment. First, some of the resources accumulated by European firms as a result of faster growth in the EC are likely to be used to fund expansion out of Europe. Defensive strategies provide a second reason. Some French plastics companies have recently explored the possibility of opening plants in Canada, in part because they anticipate difficulties competing in the post-1992 European market. They therefore seek to expand into Canada because they see their technology as superior to that of most North American producers, and they can export from Canada into the United States.

**c) Pharmaceuticals**

In pharmaceuticals, the effects of Europe 1992 should be most dramatic. Movement towards common product standards and the mutual acceptability of licensing procedures, transparency in Member State price and social security refund decisions, both in the context of substantial inter-country price differentials within the EC, should provide very considerable opportunities, particularly for firms willing to invest in European production facilities.

Are Canadian firms likely to take up these advantages? The bulk of the Canadian pharmaceutical industry is made up of U.S. and European multinationals performing rather modest processing operations in Canada. They are already present in the EC and certainly well placed to exploit the opportunities provided by Europe 1992. But in interviews conducted for this study respondents were somewhat bleak about the prospect of appreciable effects on Canadian production.[50] Product mandates are a possibility in this industry as they are in commodity chemicals and plastic resins. The generally small-scale character of Canadian pharmaceutical branch plants makes the case for such mandates at present less convincing. Canadian production facilities include both older, more labour-intensive equipment and modern units. Multinational firms could supplement their long, dedicated production runs in the U.S. through excess capacity in their shorter, more flexible Canadian operations, particularly the more modern ones, for export of specific, specialized products with limited market volume. In any case, the firms in question have plants in Europe with chronic overcapacity out of which they can supply the entire Community market. Any product mandates for Canadian divisions would likely be restricted to (parts of) the North American market.

The other part of the Canadian industry is generic drug manufacturers. With the exhaustion of patent protection on a number of important drugs, generic drug manufacture is becoming more important on a world scale. Canadian firms have experience in the production and marketing of generic drugs. This is an area where there is a greater likelihood that Canadian firms can exploit Europe 1992 either through exports or through direct investment. However, this is an industry where several Canadian producers have had painful experiences in their attempts to register products in Europe. The industry anticipates that, even after 1992 (and assuming that the degree of trade liberalization promised is actually delivered), licensing procedures will be far more cumbersome and (given chronic overcapacity in the industry) profit margins lower in Europe than in much of the rest of the world. For the foreseeable future, Canadian-produced generic drugs will find better markets in other parts of the world.

In general, then, Europe 1992 promises rather modest benefits for the Canadian pharmaceutical industry. The important possible exception is biotechnology.

**d) Biotechnology**

Canada has a number of new, energetic, small biotechnology firms, in particular in the areas of vaccines, insulin, and diagnostic kits. The recent competition for control of Connaught Bioscience between Institut Mérieux on the one hand and Ciba-Geigy and Chiron on the other attests to technical strength in this area. In addition, Canada's strong resource industries give Canadian companies a head start in applying biotechnology in those areas.

Biotechnology, moreover, is an area where Europe seems to lag behind somewhat, so that much of the trade liberalizing effect of Europe 1992 will redound to the benefit of non-EC firms: the principal competitors to Canadian firms attempting to enter the European market will be American and Japanese firms. These will provide tough competition, but there are openings to be exploited and several Canadian firms are already successfully taking advantage of them.

In the medical section of this industry, product licensing is a sine qua non of market penetration. Product licensing in Europe has been a real problem in the past and there is some suspicion that a number of EC firms have intervened with government agencies to delay or deny granting of licences for competitors' products. If Europe 1992 actually delivers the standardized and transparent licensing procedures it promises, a number of Canadian firms that have been discouraged from entry into one or another EC national market in the past (but have secured entry into other EC national markets) are ready to attempt entry again.

## 4. STRATEGIES

### 4.1 Private Sector Strategies

- For the multinational corporations in the chemical industry the principal strategy is to monitor the changes in EC regulations. Those American multinationals that already have subsidiaries in Europe may, through membership in the CEFIC, also be given the opportunity to have some input into Community-wide standards set by CEN.

- Smaller firms, particularly in pharmaceuticals and biotechnology, reported two major strategies. One was to pay little attention to what was going on in Europe, concentrating instead on developing markets in other parts of the world that promise to be more lucrative. The other was to qualify for treatment as a European company by setting up a European subsidiary, either wholly owned, jointly owned with another Canadian company, or as a joint venture with a European company.

- There was an awareness on the part of some respondents in trade associations and in some companies that one effect of Europe 1992 is likely to be more competition from European companies in markets outside Europe, including North America. No clear strategy was associated with this awareness, but there was a sense that firms ought to be conscious of what could lie ahead.

### 4.2 Public Sector Strategies

- The chemical industry is a science-based industry. Respondents thought that the most important contribution government could make would be to provide assistance to R&D to better prepare for competition against stronger European companies. The importance of adequate government funding to R&D has been emphasized frequently by industry associations in recent years.

- Some small firms emphasized the importance of government-organized trade missions in the development of new markets, having found them very useful in the past.

## 5. OPPORTUNITIES AND RISKS

### 5.1 For Firms that Are "Present"

- Firms that have subsidiaries in Europe will be able to enjoy an administratively simplified operating environment and an expansion of their feasible market as non-tariff barriers are reduced or eliminated. Their only concern is that they may not sufficiently exploit the growth produced by Europe 1992 and, as a result, may find themselves vulnerable to loss of market to, or takeover by, firms that have more successfully exploited Europe 1992.

- Firms that currently export to Europe are also likely to profit from growth in the EC market and will also experience some spillover of the advantages of simplified administrative procedures (e.g. packaging and labelling) and harmonization of product standards. None interviewed for this study thought they would be any worse off in these respects after 1992. Exporters of commodity or specialty chemicals, in particular, are unlikely to be any worse off as a result of Europe 1992.

But, for manufacturers of products for which licensing and registration are critical -- particularly pharmaceuticals and biotechnology -- there is the risk that the application of licensing and registration procedures will discriminate between EC and non-EC producers. If that happens, even if there is some elimination of administrative barriers and simplification of product registration for them, their relative competitive position will worsen as the opportunities for their Europe-based rivals will further improve.

### 5.2 For Firms that Are "Not Present"

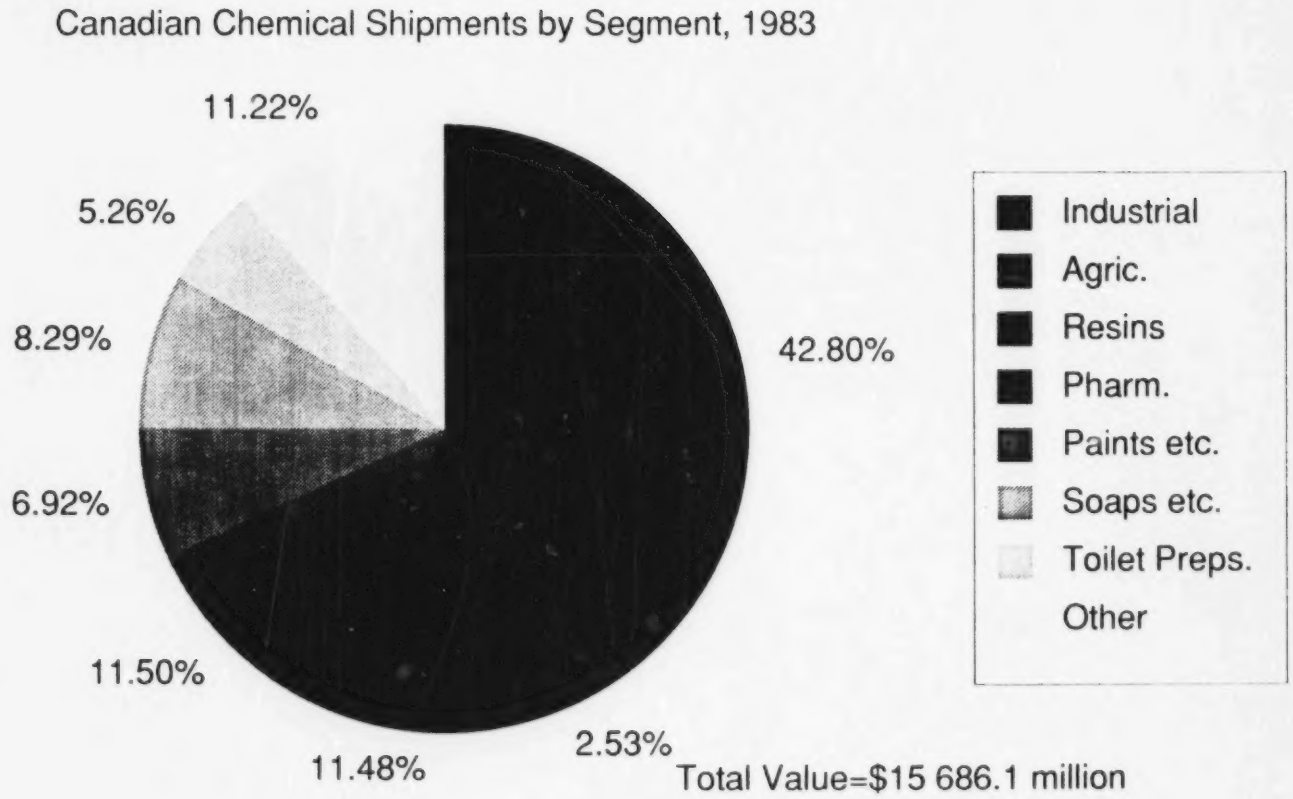
There is no evidence that Europe 1992 will make it harder for firms to break into the European market in the future. Even if the Single Market creates a still larger number of internationally competitive European firms there will still be profitable openings to be exploited within Europe. Consequently, the fact that some Canadian firms have no plans to enter Europe in the near future because they currently see better export opportunities in the United States or the Third World does not mean that they will be barred from entering later.

However, such firms should not assume that Europe 1992 has no relevance for them. Many observers expect one of the principal effects of the changes will be the strengthening of EC firms in markets outside Europe, including within North America itself. There is evidence of that already happening in the plastics industry.

# APPENDIX

## FIGURES

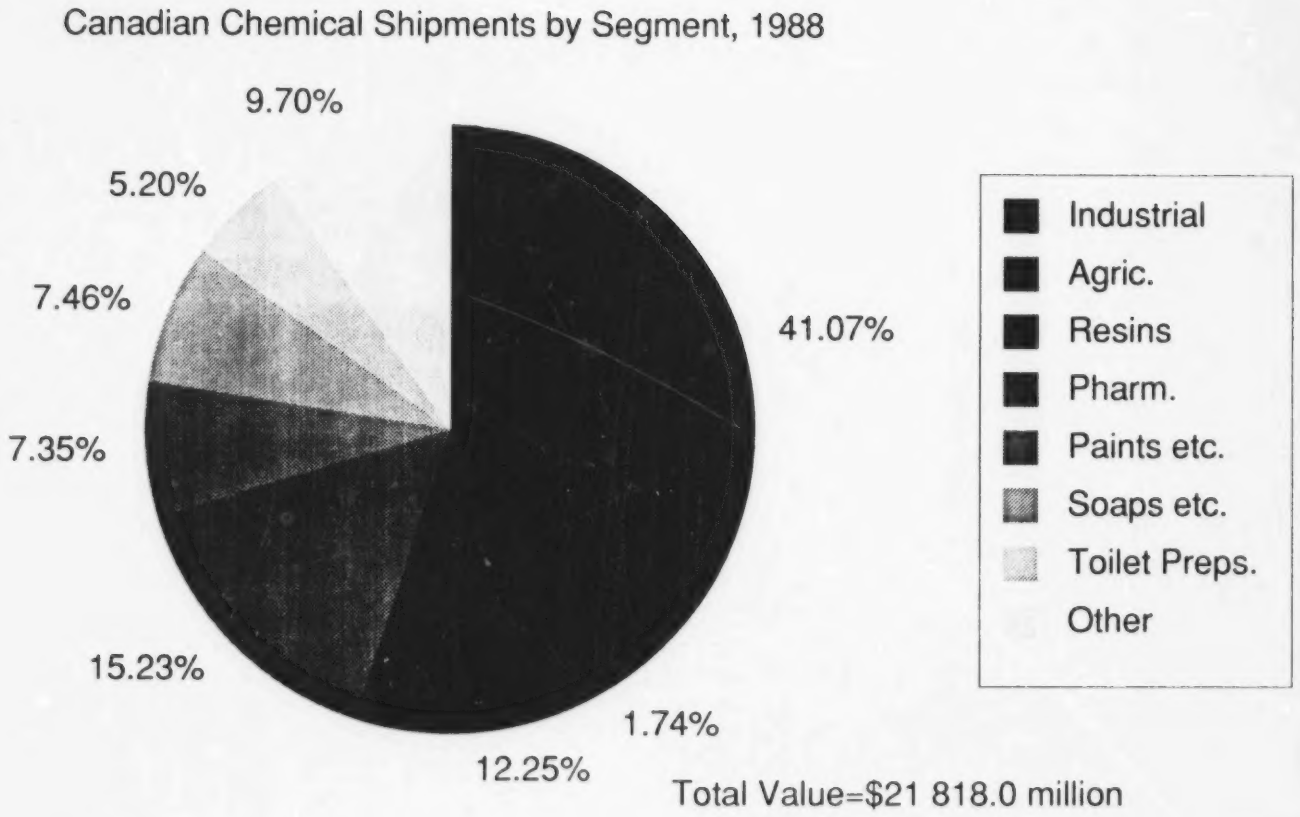
**FIGURE 1**




Source: *Chemicals Directorate Statistical Review, 1988* (ISTC), Table 2.

Note: SIC codes: Industrial Chemicals (371), Other Agricultural Chemicals (372), Plastics and Synthetic Resins (373), Pharmaceuticals and Medicines (374), Paints and Varnish (375), Soap and Cleaning Compounds (376), Toilet Preparations (379).

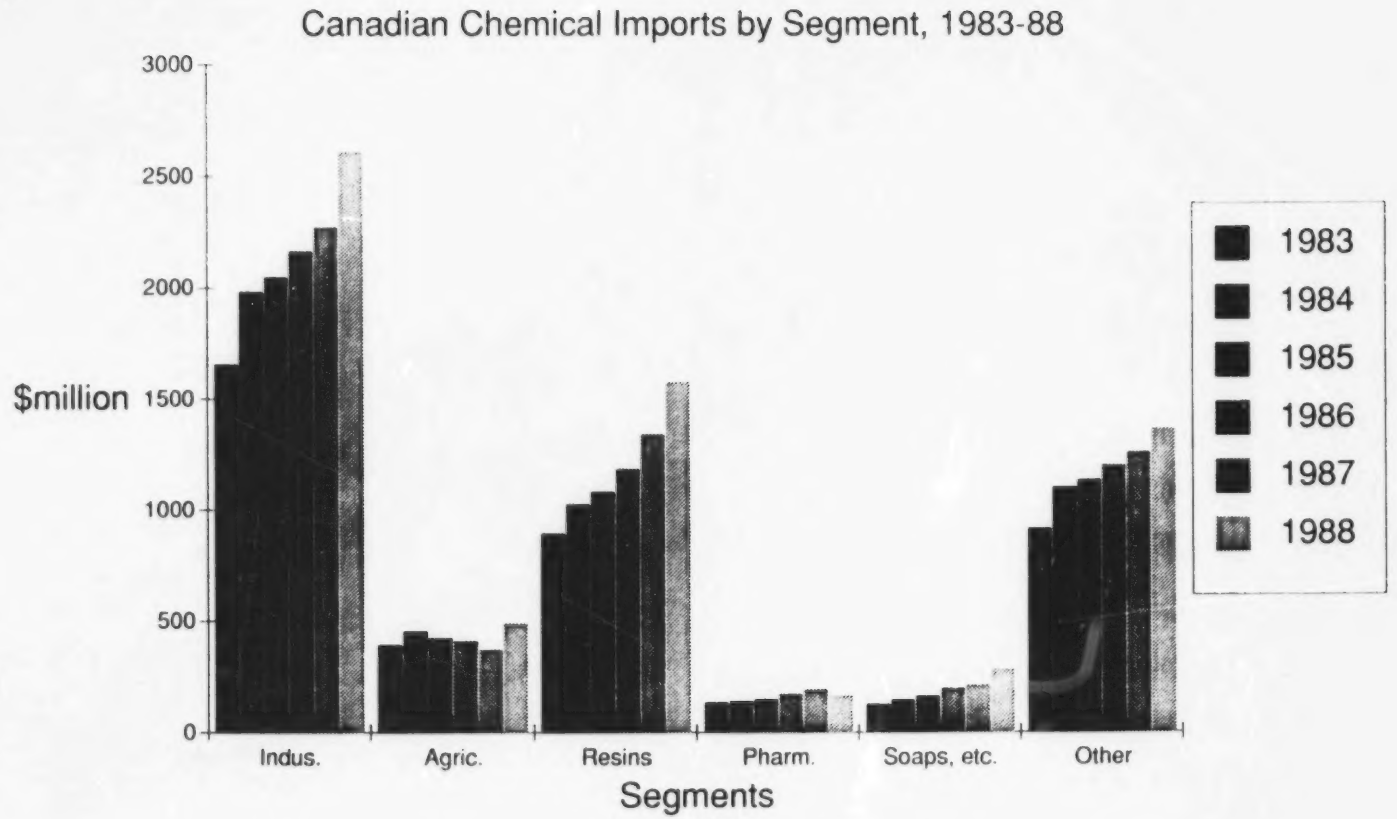
**FIGURE 2**




Source: *Chemical Directorate Statistical Review, 1988* (ISTC), Table 2.

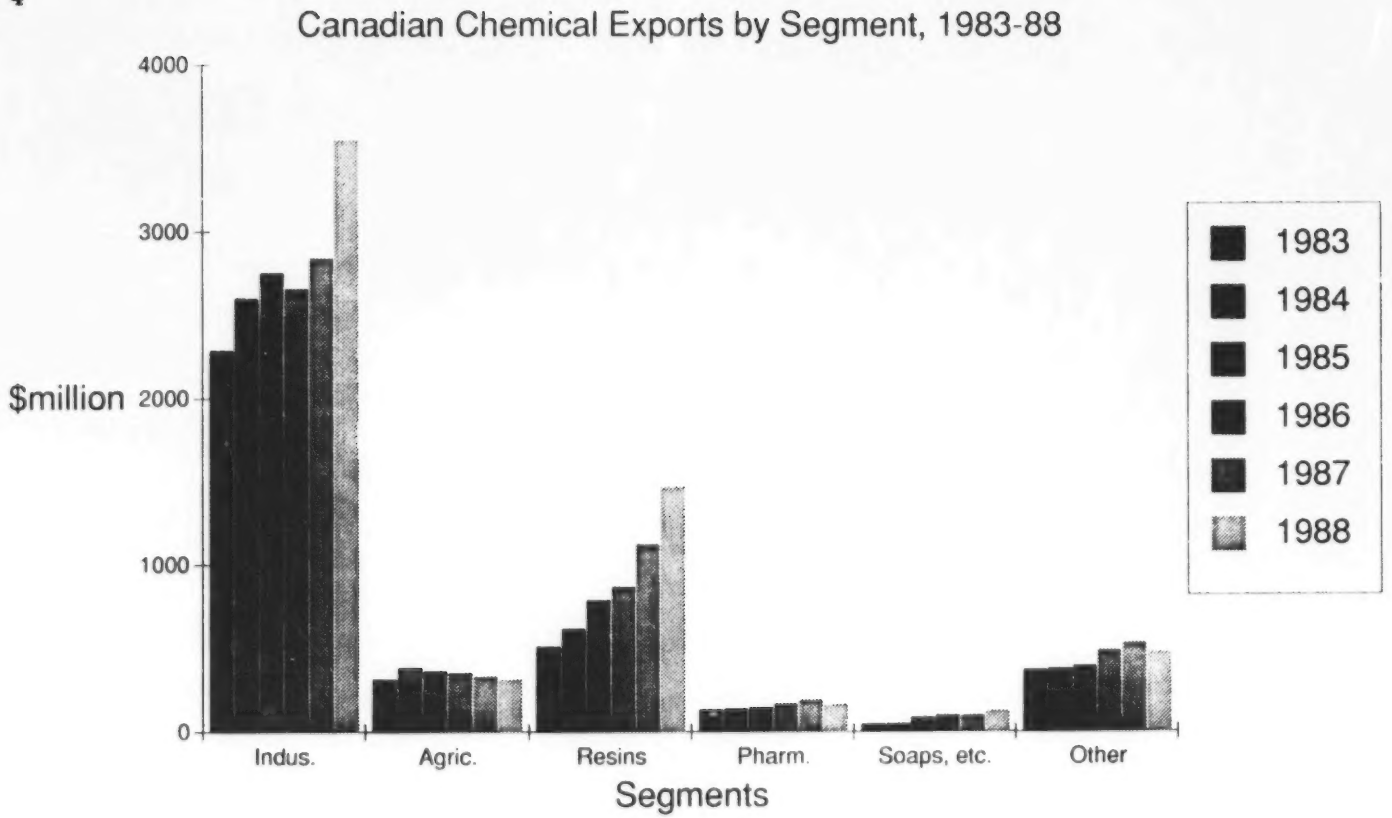
Note: SIC codes: Industrial Chemicals (371), Other Agricultural Chemicals (372), Plastics and Synthetic Resins (373), Pharmaceuticals and Medicines (374), Paints and Varnish (375), Soap and Cleaning Compounds (376), Toilet Preparations (379).

**FIGURE 3**




**Source:** *Chemicals Directorate Statistical Review, 1988* (ISTC), Table 2.

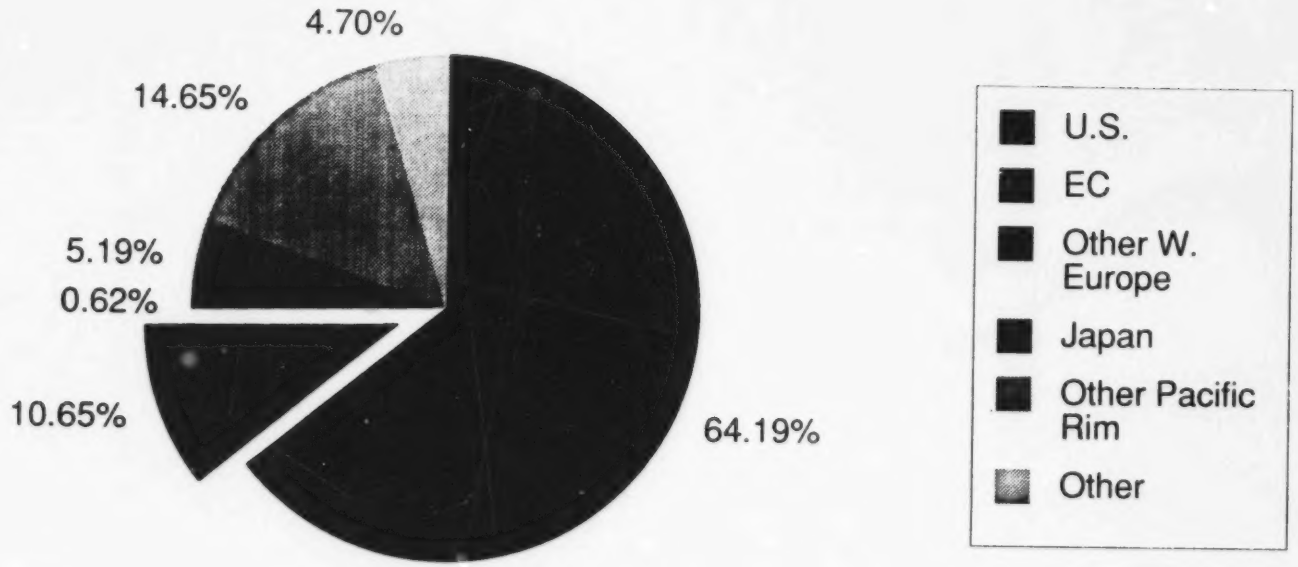
**FIGURE 4**




**Source:** *Chemicals Directorate Statistical Review, 1988* (ISTC), Table 2.

**FIGURE 5**

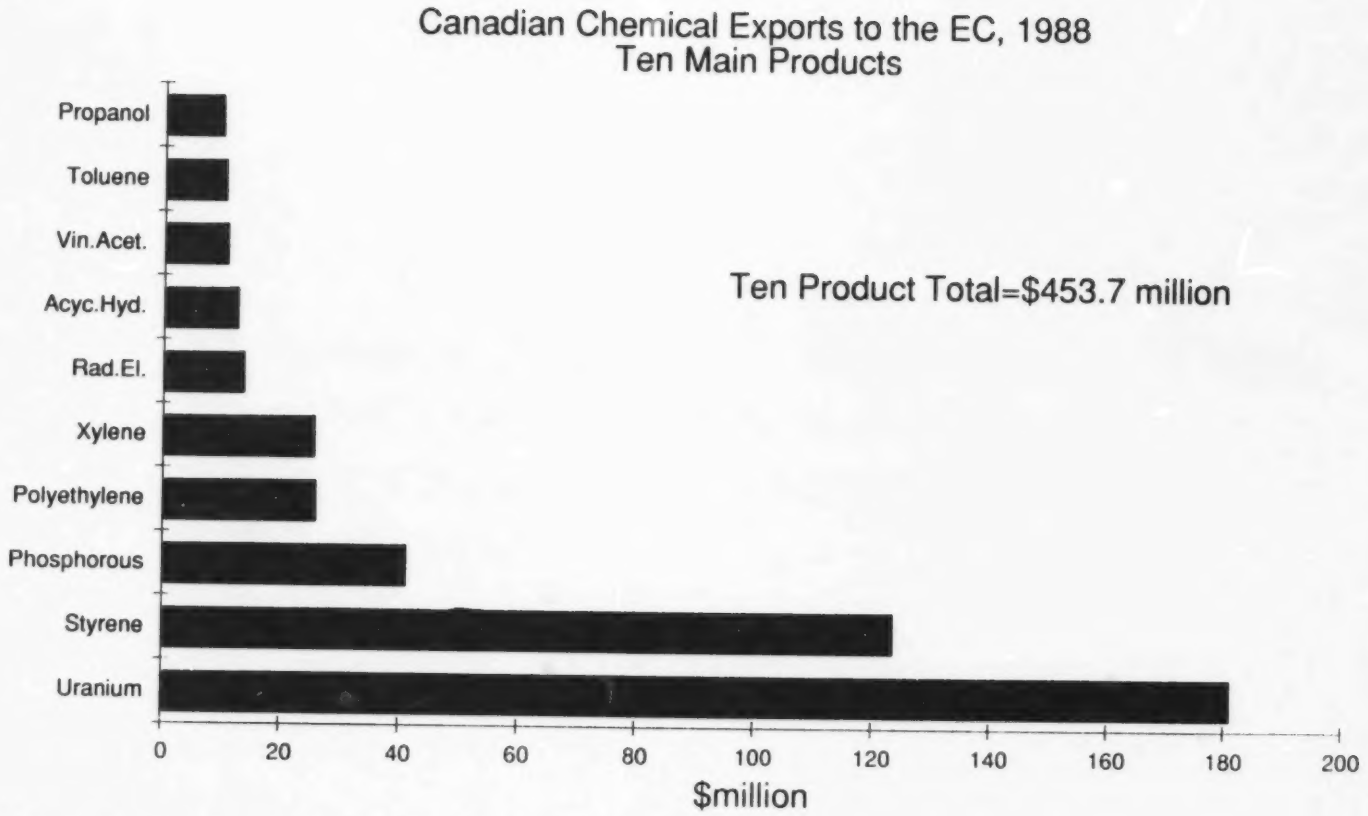
Destination of Canadian Chemical Exports, 1988




Total Exports=$6 035.5 million

**Source:** *Chemicals Directorate Statistical Review, 1988* (ISTC), Table 7.

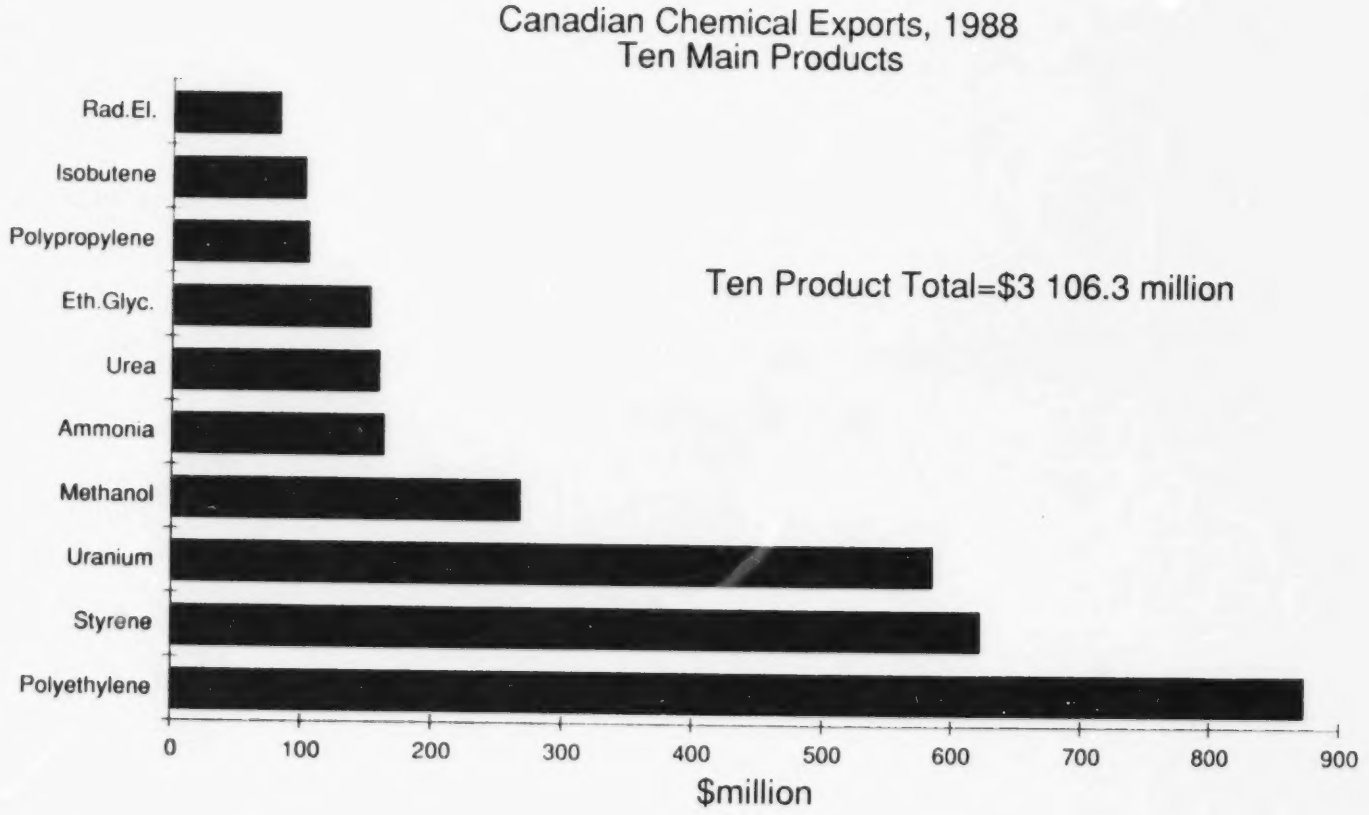
**FIGURE 6**




Source: *Chemicals Directorate Statistical Review, 1988* (ISTC), Table 10.

Note: Full names of chemicals listed are as follows: Polyethylene, low and high density (SIC 3712, 390110 and 390120); Styrene (SIC 3712, 29050); Natural Uranium (SIC 3711, 284410); Methanol (SIC 3712, 290511); Ammonia, anhydrous and aqueous (SIC 3711, 281410 and 281420); Urea, aqueous or not (SIC 3721, 31210); Ethylene Glycol (SIC 3712, 290531); Polypropylene (SIC 373, 390210); Isobutene-isoprene rubber (SIC 400231); Radioactive elements and isotopes not elsewhere specified (SIC 3711, 284440).

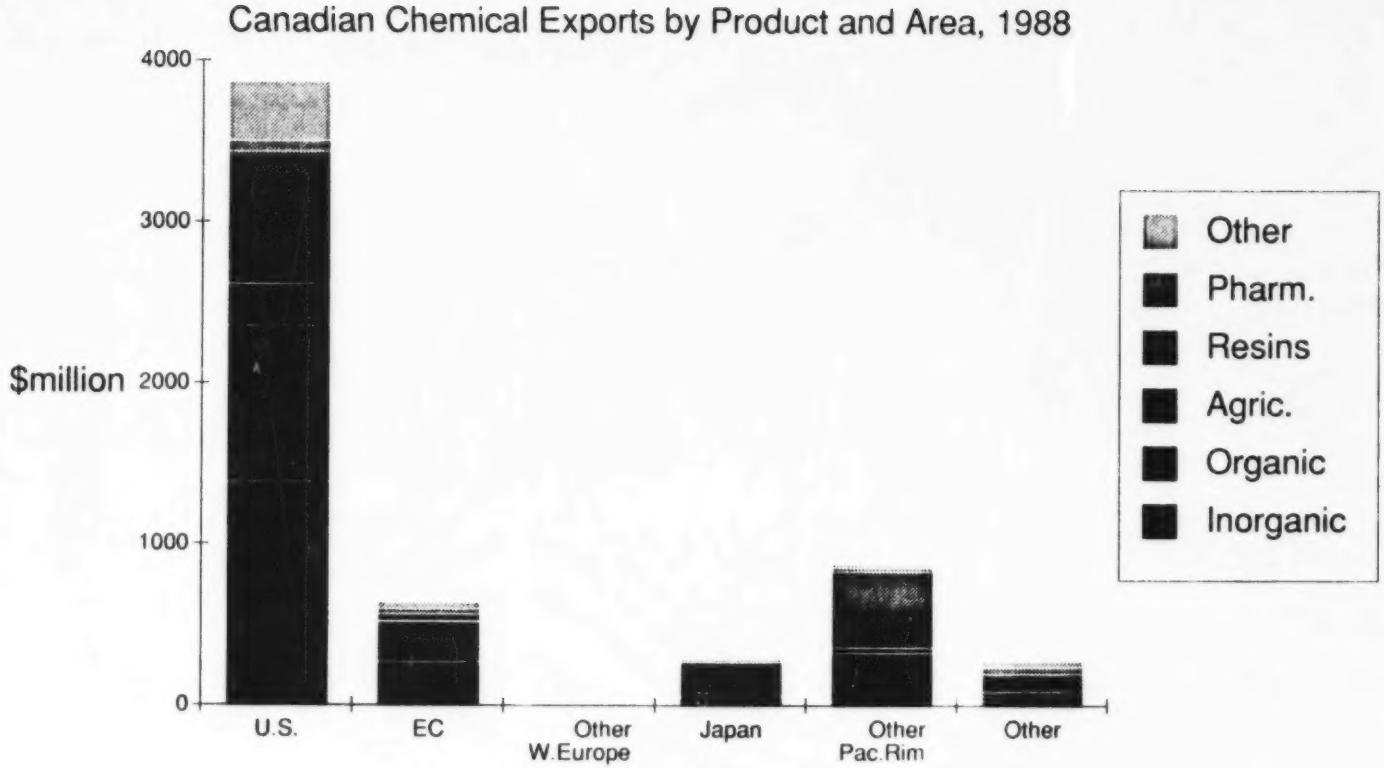
**FIGURE 7**




Source: *Chemicals Directorate Statistical Review, 1988* (ISTC), Table 10.

Note: In addition to the chemicals listed above, the full names of the chemicals in this figure are: Phosphorus (SIC 3711, 280470); Xylene (SIC 3712, 290244); Acyclic Hydrocarbons not elsewhere specified (SIC 3712, 290129); Vinyl Acetate (SIC 3712, 290230); Toluene (SIC 3712, 290230); Propon-1-o1+-2o1 (SIC 3712, 290512).

**FIGURE 8**

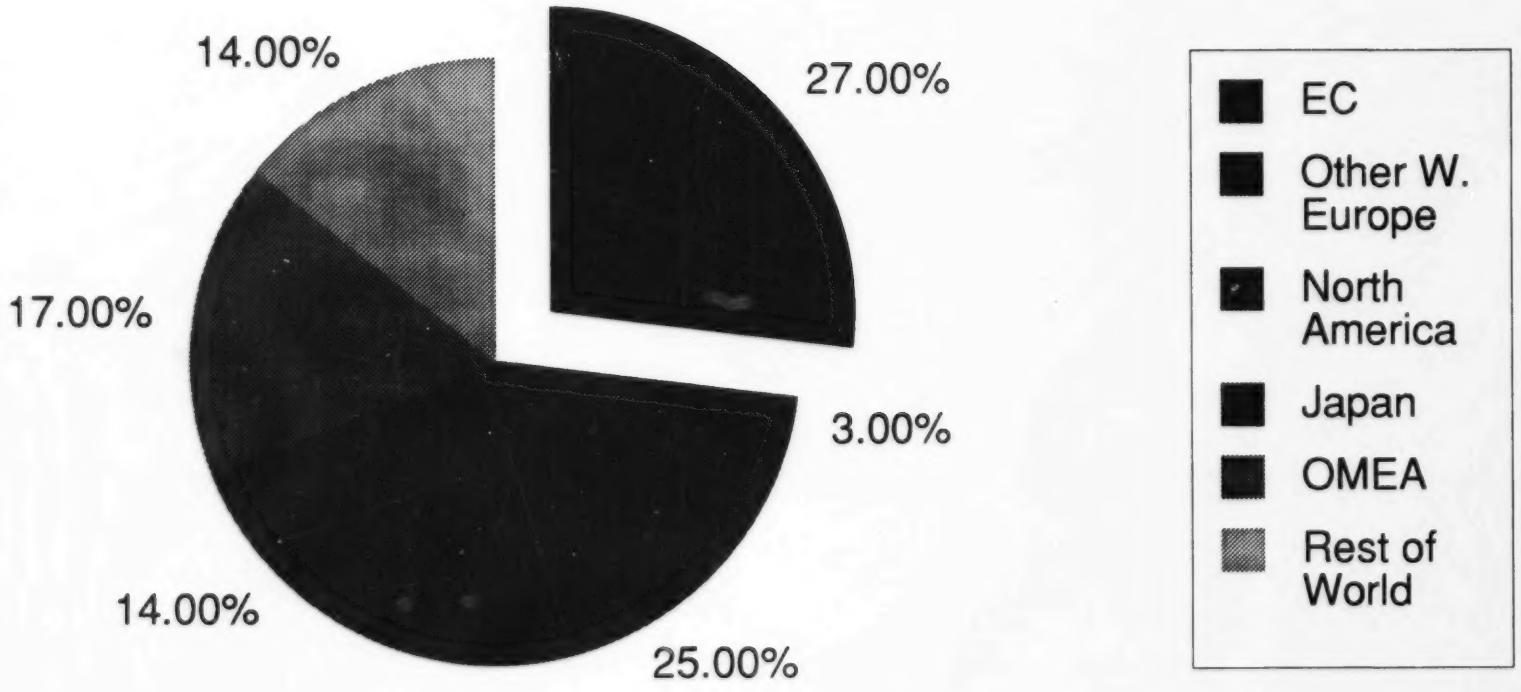



Source: *Chemicals Directorate Statistical Review, 1988* (ISTC), Table 10.

Note: Inorganic Chemicals (3711), Organic Chemicals (3712), Agricultural Chemicals (372), Synthetic Resins and Elastomers (373), Pharmaceuticals (374). Other includes Toilet Preparations (377), Paints and Varnish (375), Soap and Cleaning Compounds (376), Other Chemical Products (379).

**FIGURE 9**

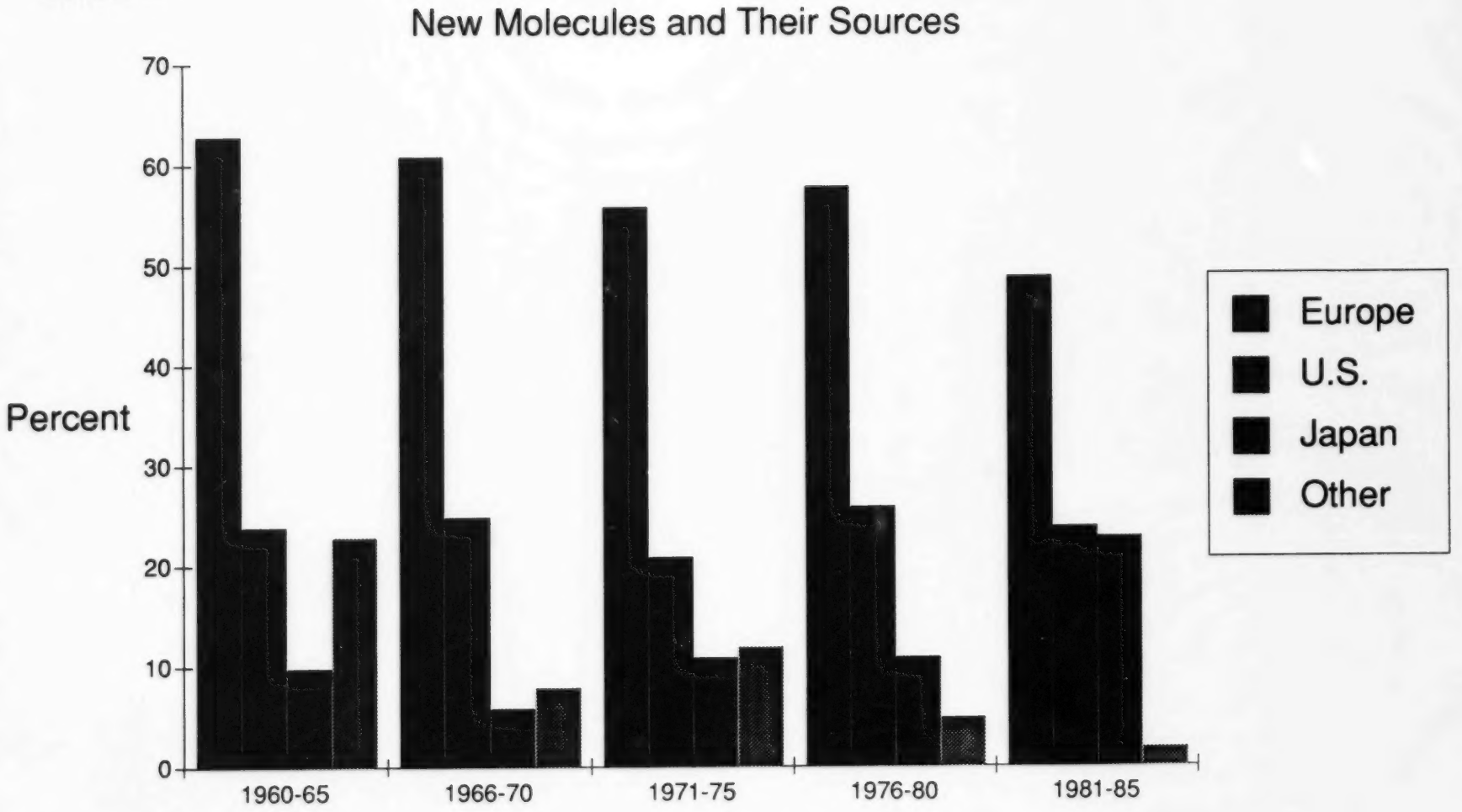
## World Chemical Industry: Output Shares, 1986




Source: *Panorama of EC Industry 1989*, Table II, p. 7-3 (NACE 25).

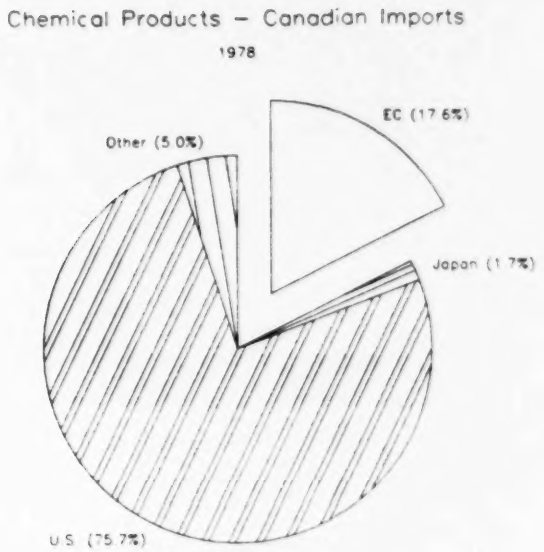
Note: OMEA stands for Other Middle East and Asia.

FIGURE 10



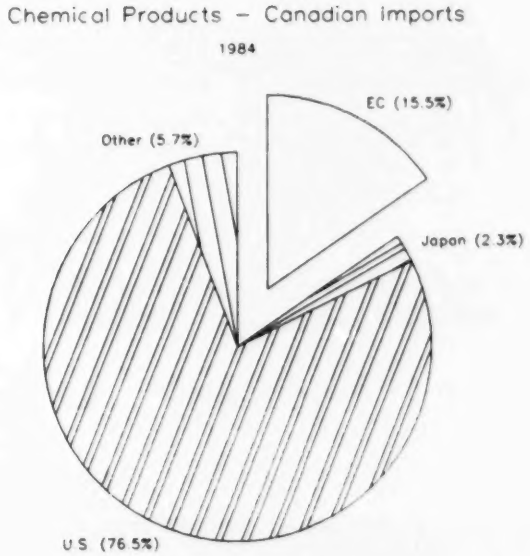

Source: *Panorama of EC Industry 1989*, Table III, p. 8-2 (NACE 257).

**FIGURE 11**



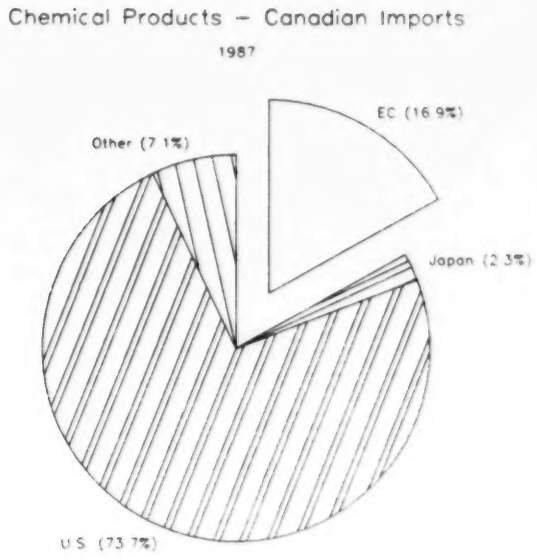

Source: Informetrica and Statistics Canada.

**FIGURE 12**



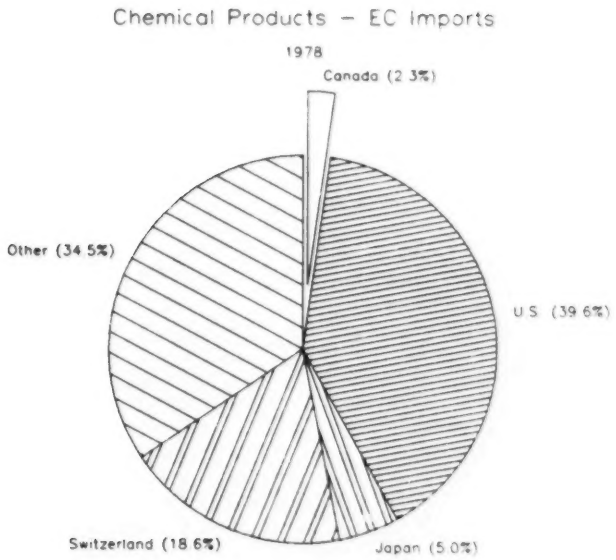

Source: Informetrica and Statistics Canada.

**FIGURE 13**



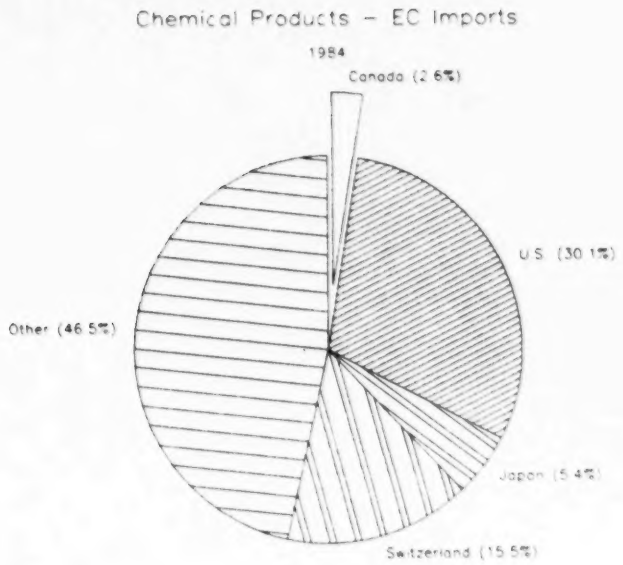

**Source: Informetrica and Statistics Canada.**

**FIGURE 14**



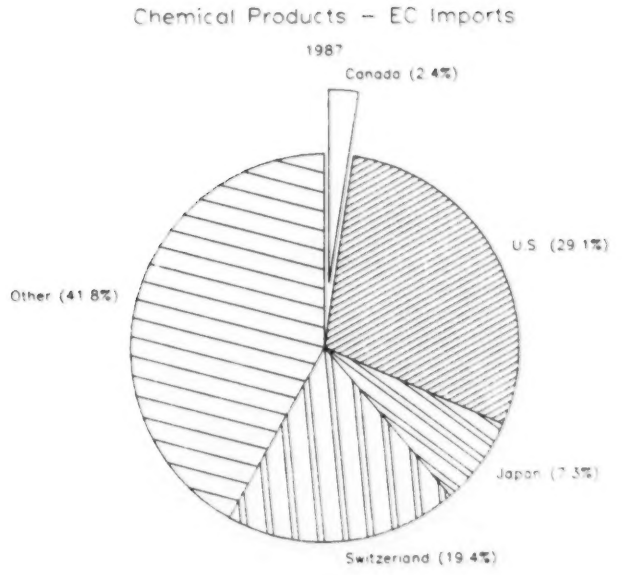

**Source: Informetrica and Statistics Canada.**

**FIGURE 15**




**Source: Informetrica and Statistics Canada.**

**FIGURE 16**




**Source: Informetrica and Statistics Canada.**

**FIGURE 17**

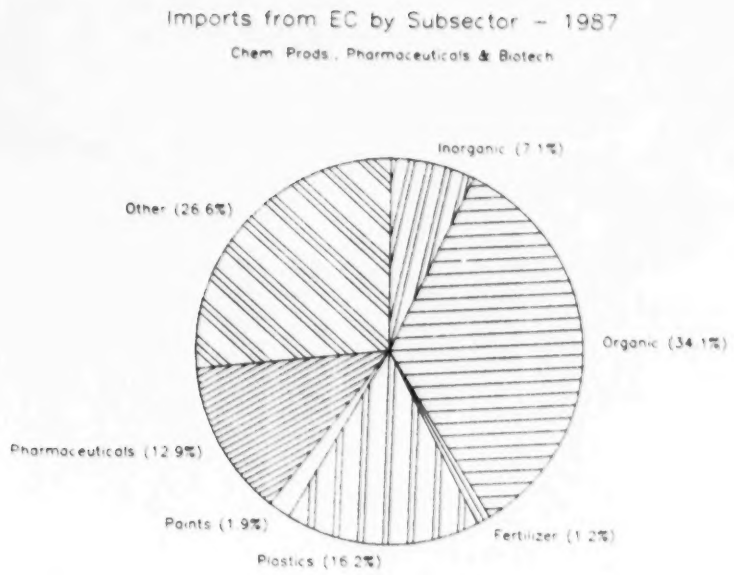



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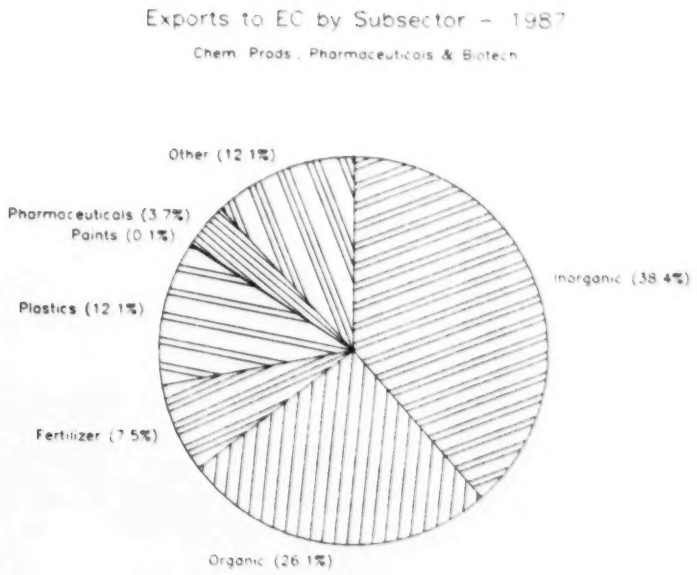
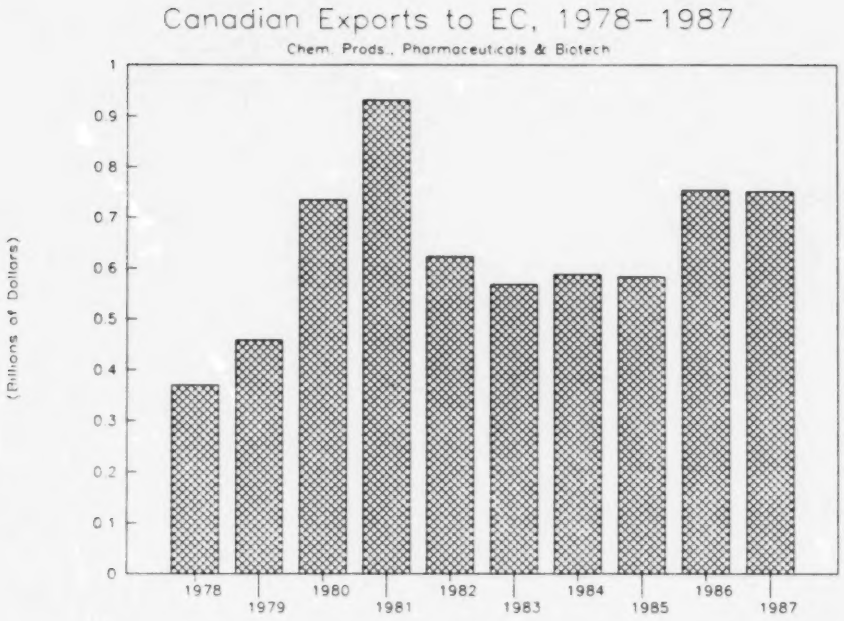
**FIGURE 18**



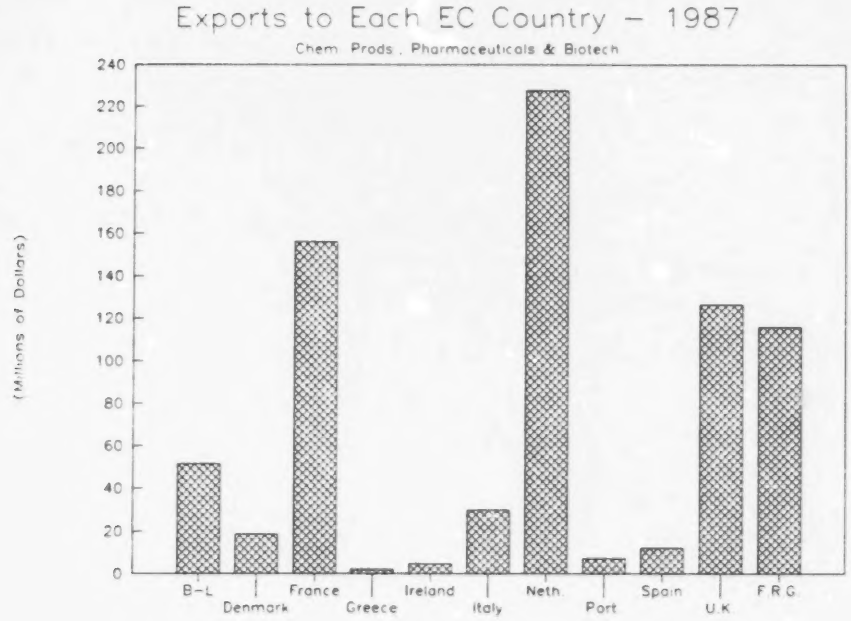

**Source: Informetrica and Statistics Canada.**

**FIGURE 19**



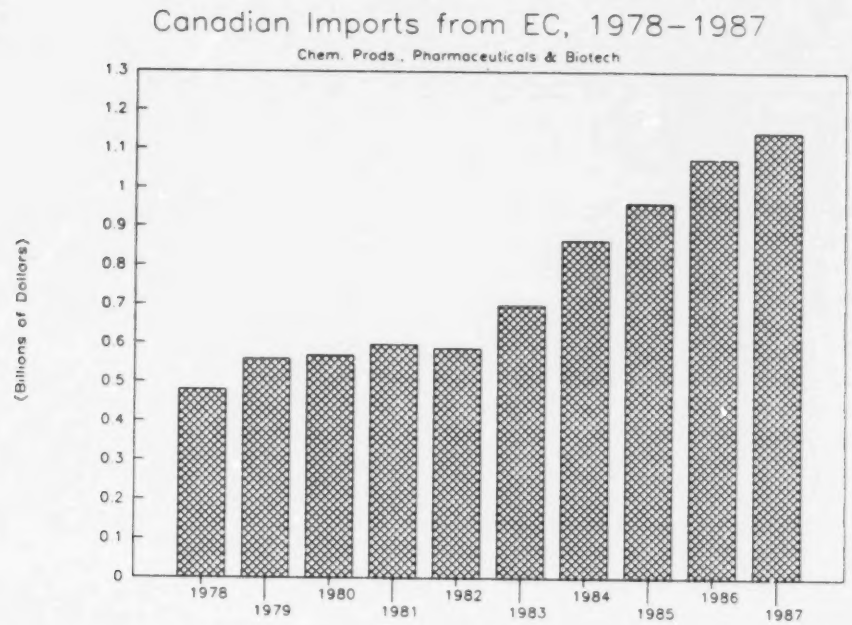

**Source: Informetrica and Statistics Canada.**

**FIGURE 20**



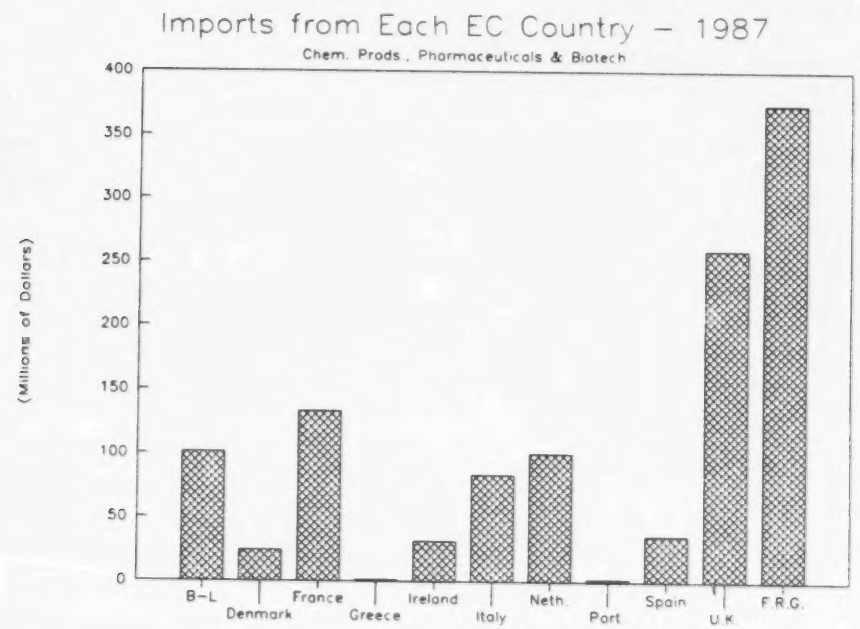

**Source: Informetrica and Statistics Canada.**

**FIGURE 21**



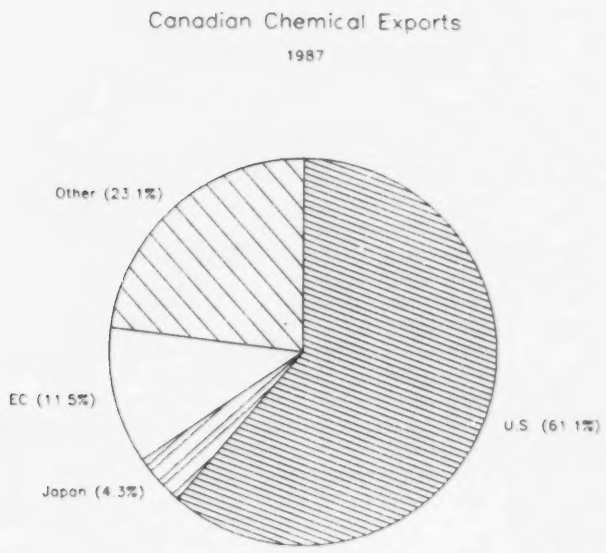

**Source: Informetrica and Statistics Canada.**

**FIGURE 22**




**Source: Informetrica and Statistics Canada.**

**FIGURE 23**




Source: Informetrica and Statistics Canada.

## NOTES

1. See "European chemicals: Shake, heat, squeaky-pop," *The Economist* (July 16, 1988): pp. 68-69 and Patricia Layman, "Fine chemicals adjust to changing markets," *Chemical and Engineering News* (March 30, 1987): pp. 10-11.

2. *Investing in Canada's Fine and Specialty Chemicals Industry*, Chemicals and Investments Directorate, Department of Regional Economic Expansion, Ottawa, 1988: p. 5.

3. In the relevant statistics uranium is classified under "chemicals and chemical products" as an industrial inorganic chemical. But the Canadian Chemical Producers Association does not consider it as such. Strictly speaking, in terms of Europe 1992, uranium is an energy issue. However, the broad message of Figures 6 and 7 remains the same whether uranium is included or excluded.

4. This was true of the average price of Canadian-produced oil: from 1981 newly discovered oil was priced at world levels. See John F. Helliwell et al., "The Western accord and lower world oil prices," *Canadian Public Policy* Vol. 12 (1986): pp. 341-355.

5. See Sheila Arnott, "Bullets bitten, chemical firms restructure," *Financial Post* (January 25, 1986): p. 26; Nicholas Hunter, "Chemicals: A leaner industry hopes to do better with freed-up energy prices and freer trade," *Report on Business Magazine* (July, 1986): pp. 71-72; Nino Wischnewski, "DuPont geared for trade challenge," *Financial Post* (February 1, 1988): p. 25.

6. The performance of the Canadian industry over the last few years is usefully chronicled in a series of articles by Earl Anderson in *Chemical and Engineering News*. See "Profits make a strong recovery," Vol. 65 (December 14, 1987): pp. 43-44; "Rising exports buoy already surging chemical sales," Vol. 66 (December 12, 1988): pp. 41-42; "Good, but slower, growth for Canadian chemicals," Vol. 67 (June 22, 1989): pp. 25-27.

7. See Table 2 and *Chemicals Directorate Statistical Review, 1988*. These figures are misleading however; though since 1982 they include plastics production in the auto industry, they do not include a number of major plastics manufacturers, such as Northern Telecom (telephone sets) or Black & Decker (power tools). Furthermore, in interviews conducted for this study it was reported that there were more than 2 000 firms and 100 000 workers in the sector. The inconsistency between this estimate and the figure reported in Table 2 is one index of the difficulties of industry classification in this sector.

8. T.A. Wheat, "Advanced ceramics in Canada," *CIM Bulletin* Vol. 80 (April, 1987): pp. 43-48.

9. Guy Paquin, "La supraconductivité: L'IREQ mise beaucoup sur le fil surgelé," *Le Devoir* (November 27, 1989): p. 7.

10. M.K. Murthy, *Advanced Ceramics*, Department of Regional Industrial Expansion, Office of Industrial Innovation, Report No. 3/86. Ottawa: 1986.

11. Gayle MacDonald, "Drug bill hasn't soothed price row," *Financial Post* (October 31, 1988): pp. 43-44.

12. Andrew Coyne, "Big doses of research keep industry healthy," *Financial Post* (May 4, 1987): p. 43.

13. *Pharmaceuticals and Medicines*, ISTC Industry Profile (Ottawa: no date): p. 5.

14. *Pharmaceuticals and Medicines*, p. 4.

15. Hemant K. Shah, "The next decade in generic pharmaceuticals," *Business Quarterly* Vol. 50 (1985): p. 96.

16. Nanette Newell, "The next decade in biotechnology," *Business Quarterly* Vol. 50 (1985): pp. 87-90; William A. Cochrane, "Biotechnology and the Canadian pharmaceutical industry," *Business Quarterly* Vol. 50 (1985): pp. 91-94; Tamara J. Erickson, "The next decade in pharmaceuticals," *Business Quarterly* Vol. 50 (1985): pp. 79-82.

17. Jessie Weldon and David B. Shindler, *1988 Canadian Biotechnology Industry Sourcebook*, Ottawa: Ministry of State for Science and Technology, 1988: p. 11.

18. *Les Biotechnologies au Québec: La Conquête d'un Nouveau Monde*, Legault, Grysole et Associés, Inc. 1989.

19. *Les Biotechnologies au Québec*, p. 4.

20. B.J. Spalding, "How biotechnology is faring as an industry," *Chemical Week* (December 3, 1986): pp. 9-13.

21. "European chemicals," p. 69; *Panorama of EC Industry 1989*, p. 7:6.

22. Jane Blansfield and Paula M. Block, "Spain merges four firms to compete in Europe," *Chemical Week* (May 21, 1986): pp. 30-31.

23. "European chemicals," p. 68.

24. "European chemicals," p. 69. On the method used by Unilever to expand its specialty chemicals operations see Patricia L. Layman, "Anglo-Dutch giant Unilever works to build specialties business," *Chemical and Engineering News* Vol.67 (June 24, 1989).

25. "European chemicals," p. 68.

26. Peter J. Buckley and Patrick Artisian, "Policy issues of intra-EEC direct investment: British, French and German multinationals in Greece, Portugal and Spain, with special reference to employment effects," *Journal of Common Market Studies* Vol. 26 (1987): pp. 207-230.

27. *Panorama of EC Industry 1989*, p. 7:1.

28. *Europe in 1993: Economic Outlook by Sector*, BIPE, Paris, 1989.

29. These figures apply to the production of low-density polythene, high-density polythene, polypropylene, polystyrene, and polyvinyl chloride. See *Panorama of EC Industry 1989*, p. 7:3.

30. See *Panorama of EC Industry 1989*, chs. 6 and 7.

31. *Panorama of EC Industry 1989*, p. 6:4.

32. Murthy, *Advanced Ceramics*, pp. 92-103.

33. Commission des Communautés Européennes, Direction Générale des Affaires Économiques et Financières, *Économie Européenne* No. 35 (March, 1988): p. 73.

34. *Europe in 1993: Economic Outlook by Sector*, BIPE, Paris, 1989.

35. *Économie Européenne* No. 35 (March, 1988): p. 74.

36. *Panorama of EC Industry 1989*, p. 8:1.

37. Thus Jean-François Dehecq, the chairperson of Sanofi S.A., explained his firm's (unsuccessful) attempt to buy the U.S. firm, A.H. Robbins as follows: "We absolutely must be in the U.S. market by 1992 to sell the new drugs our research labs will be producing," and "In the United States, they know that customers are different in New York, Los Angeles and Chicago. Here, a consumer in Paris has more in common with one in Brussels than with one in Marseilles. But we are organized nationally, not regionally." See Philip Revzin "U.S., European firms prepare for 1992 market deadline: Many European firms already have started quiet internal restructuring," *Europe* No. 275 (1988): pp. 16-18.

38. Mark F. Cantley, "Long term prospects and implications of biotechnology for Europe: Strategic challenge and response," *International Journal of Technology Management* Vol. 1 (1986): pp. 228-229.

39. Susan R. Jones, et al., "Sweeter prices for EC carbohydrates," *Chemical Week* Vol. 139 (November 19, 1986): pp. 54-55.

40. Cantley, "Long term prospects."

41. Pharmaceuticals are included among the products qualifying for the reduced rate. The others are foodstuffs (except alcoholic drinks), energy for heating and lighting, water supplies, books, newspapers and periodicals, and passenger transport. On the EC tax proposals see Richard Watson "There's more to tax than Martelange," *Euromoney* 1992 Supplement (1988): pp. 17-19.

42. *EC 1992: A Commerce Department Analysis of European Community Directives* Vol. 1. U.S. Department of Commerce, International Trade Administration (1989): p. 85.

43. See Richard M. Tachuk, "Pirating intellectual property: International copycats are pirating everything from pharmaceuticals to jogging shoes," *Canadian Business Review* (1987): pp. 16-20.

44. The relevant directives are: Regulation on Community trademarks, COM(80)636 and COM(84)470; Regulation on rules needed for implementing the Community trademark, COM(85)844; Regulation on rules of procedure for the Boards of Appeal of the Community's trademark office, COM(86)731; Community trademark office -- Regulation on fees, COM(86)742.

45. *Europe 1992: Working Group Progress Reports*, External Affairs and International Trade Canada, (1989), p. 11.

46. See Gordon Pitts, "The new Europe: 1992," *Financial Post* (June 28, 1989): pp. 7-8.

47. Herb Short, Eric Johnson, and David Hunter, "Quality assurance, European style," *Chemical Engineering* Vol. 95, No. 14 (1988): pp. 26-28.

48. Although a representative from the CEFIC reported that it played a very minor role in the deliberations of CEN and the normalization process. This may either be because, contrary to the feers of some North American producers, the standards-setting process has a rather marginal interest for most of the chemical industry, or it may be because European firms prefer to intervene directly or through national associations rather than through CEFIC. To the extent that multinationals wish to influence the standards-setting process, they do this most effectively through the national standards body of the Member State in which they are resident. These views are then reflected in the CEN technical committees.

49. See "Pulp and paper technology changes will boost chemical needs," *Process Industries Canada* (October/November, 1987): pp. 23-26.

50. I was told by a representative of the Canadian Pharmaceutical Association that they had done no special work on Europe 1992.